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South Carolina
Department of Natural Resources
Annual Report
1995-1996



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Department of Natural Resources
PO Box 167
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South Carolina Department of Natural Resources



James A. Timmerman, Jr., Ph.D.
Director

South Carolina Natural Resources Board
Columbia, South Carolina

Gentlemen:

Attached hereto is the Annual Report of the Department of Natural Resources.

The report contains a summary of the activities and accomplishments of the Department of Natural Resources and each of its Divisions. More detailed information is available from each division on these activities.

We look forward to working with you during this next year.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "James A. Timmerman, Jr.", written in a cursive style.

James A. Timmerman, Jr.
Executive Director

TABLE OF CONTENTS

NATURAL RESOURCES BOARD	4
NATURAL RESOURCES DIRECTORS	5
NATURAL RESOURCES ORGANIZATIONAL CHART	6
DIVISION OF ADMINISTRATION AND SUPPORT	7
Fiscal Report	8
DIVISION OF CONSERVATION EDUCATION AND COMMUNICATIONS	10
Education Section	11
New and Video Section	12
Graphics and Duplicating Section	16
Magazine Section	17
GEOLOGICAL SURVEY	19
DIVISION OF LAND RESOURCES AND CONSERVATION DISTRICTS	21
DIVISION OF LAW ENFORCEMENT	30
Field Operations	31
Marine/Education Affairs	31
Staff Operations	32
DIVISION OF MARINE RESOURCES	35
Coastal Information Education & Communications Office	35
Coastal Reserves and Outreach Program	37
Personnel	38
Vessel Operations	38
Office of Management Services	39
Office of Fisheries Management	40
Marine Resources Research Institute	50
DIVISION OF WATER RESOURCES	62
Environmental Affairs Section	62
Hydrology Section	64
Office of State Climatology	65
Information Management & Analysis Section	66
DIVISION OF WILDLIFE AND FRESHWATER FISHERIES	68
Wildlife Management Section	68
Freshwater Fisheries Section	79
Wildlife Diversity Section	86



State of South Carolina

The Honorable Carroll A. Campbell Jr., Governor

South Carolina Natural Resources Board



Dr. George G. Graham
Chairman
Spartanburg

Thomas W. Miller
Vice Chairman
Anderson

Marion Burnside
Hopkins

Campbell D. Coxe
Darlington

Edwin L. Oxner
Florence

Mary Pope M. H. Waring
Charleston

FISCAL YEAR
July 1, 1995- June 30, 1996

**SOUTH CAROLINA
DEPARTMENT OF NATURAL RESOURCES**

Dr. James A. Timmerman, Director Columbia

Larry Cartee, Assistant Director Columbia

John B. Reeves, Deputy Director
Administrative Services Columbia

Prescott S. Baines, Deputy Director
Division of Conservation Education
and Communications Columbia

Dr. C. W. Clendenin, State Geologist
Geological Survey Columbia

Cary D. Chamblee, Deputy Director
Land Resources and Conservation Districts Columbia

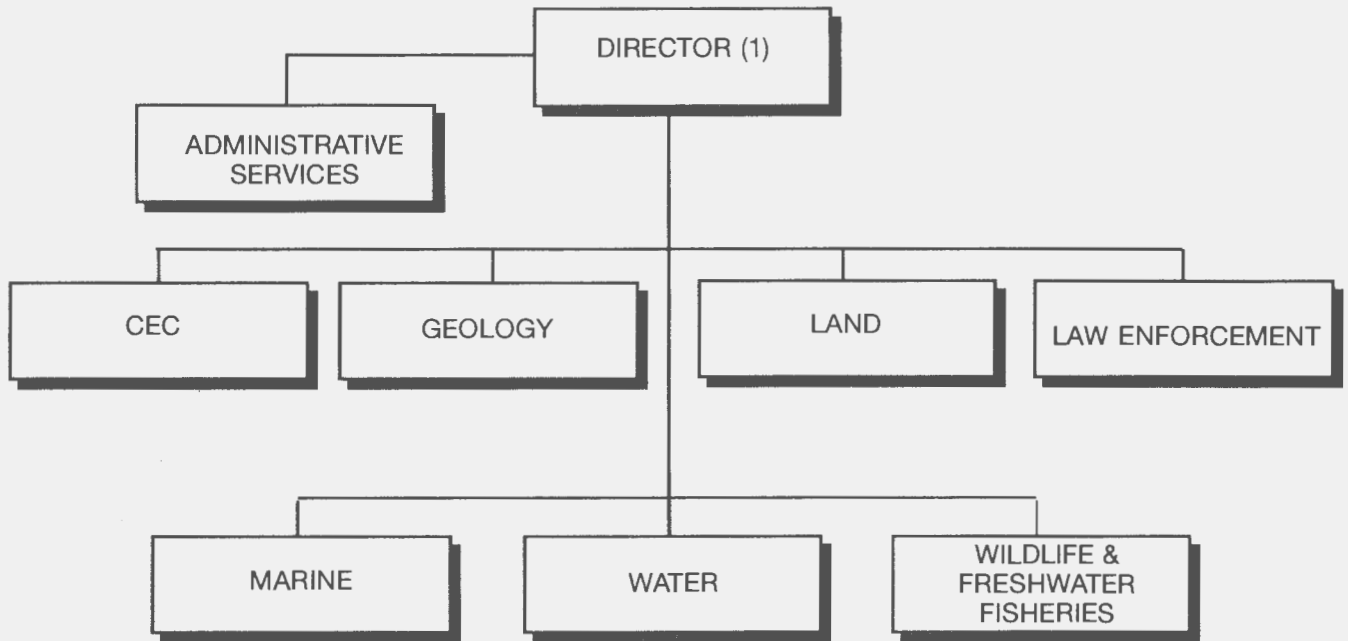
Mark W. Huguley, Deputy Director
Division of Law Enforcement Columbia

Dr. Paul A. Sandifer, Deputy Director
Division of Marine Resources Charleston

Alfred H. Vang, Deputy Director
Water Resources Columbia

W. Brock Conrad Jr., Deputy Director
Division of Wildlife and Freshwater Fisheries Columbia

South Carolina Department of Natural Resources



DIVISION OF ADMINISTRATION AND SUPPORT

Overall supervision for the South Carolina Department of Natural Resources is provided by the Director. He is appointed by the South Carolina Department of Natural Resources Board and is responsible to them.

Policy for the operation of the Department is set by the Board, which is composed of six members, one from each congressional district and one at-large, appointed by the Governor, with the advice and consent of the Senate.

The Division of Administrative Services provides administrative support for the entire Department. This support comes through the division's accounting, procurement, information technology, supply and equipment, title and registration, and construction units.

Administrative Services is responsible for the administration of all funds as required by law. These include federal, state, and other revenues. This division is also accountable for inventory and all fixed assets, construction and repairs, land owned or leased by the Department, and the sale of hunting/fishing licenses, fees, fines and permits.

The Division of Administrative Services also provides budget expertise by identifying the financial needs of the Department to the Legislature through the annual budget process. Assistance is also given to the Executive Office for special assignments and policy reviews as needed.

FISCAL REPORT

Source of Funding for Expenditures by Program FY 1996

	Appropriation	Other	Total
Administration/Support	2,459,755	1,469,779	3,929,534
Conservation Education and Communications	1,351,143	743,003	2,094,146
Titling and Registration	-0-	908,297	908,297
Game	173,282	8,272,933	8,446,215
Fish	430,721	3,044,678	3,475,399
Law Enforcement	6,531,149	5,635,478	12,166,627
Boating Safety	-0-	1,900,276	1,900,276
Marine Resources	4,607,082	4,823,467	9,430,549
Heritage Trust	585,056	489,428	1,074,484
Water Resources	2,706,007	2,771,020	5,477,027
Land Resources	1,988,577	860,848	2,849,425
Geological/Geodetic	319,749	62,208	381,957
Employer Contributions	4,351,361	3,130,499	7,481,860
TOTAL	25,503,882	34,111,914	59,615,796

STATUS OF FEES COLLECTED BY LICENSE DIVISION

JULY 1995 THROUGH JUNE 1996

NUMBER SOLD	TYPE OF LICENSE	PRICE	DEPOSITED
10,328	State Hunting License	11.00	113,608.00
3,770	County Hunting License	4.00	15,080.00
117,881	Combination Fish & Hunt	16.00	1,886,096.00
49,180	Sportsman License	43.00	2,114,740.00
3,738	Jr. Outdoorsman License	15.00	56,070.00
4,214	Res. Big Game Permit	5.00	21,070.00
4,280	Res. WMA Permit	29.50	126,260.00
14,641	Annual Non Res. Hunt. Lic.	73.00	1,068,793.00
9,983	3-Day Non. Res. Hunt. Lic.	24.00	239,592.00
1,864	10-Day Non Res. Hunt. Lic.	48.00	89,472.00
19,306	Non Res. Big Game Permit	79.00	1,525,174.00
3,772	Non Res. WMA Permit	75.00	282,900.00
3,074	Non Res. Shooting Preserve	8.00	24,592.00
193,303	State Fishing License	9.00	1,739,727.00
40,729	14-Day Res. Fish. License	4.00	162,916.00
7,164	Lakes & Reservoir	2.00	14,328.00
16,870	Annual Non Res. Fish. Lic.	34.00	573,580.00
62,157	7-Day Non Res. Fish. Lic.	10.00	621,570.00
1,162	3-Day Non Res. Lake & Res.	2.00	2,324.00
21,312	Ducks Stamps	5.00	106,560.00

\$10,784,452.00

(9,108 Duck Stamps Sold to Collectors	@	\$5.50	\$ 50,094.00)
(5,543 Saltwater Stamps Sold to Collectors	@	\$5.50	\$ 30,486.50)
(90,388 Saltwater Stamps Sold to Fishermen	@	\$5.00	\$451,940.00)

Status of Charter Vessel, Rental Boats and Fishing Pier Permits

164	CV Max. 6 Anglers	150.00	24,600.00
11	CV Max. 49 Anglers	250.00	2,750.00
15	CV Unlimited Anglers	350.00	5,250.00
54	Rental Boats	40.00	2,160.00
10	Fishing Piers	350.00	3,500.00

\$38,260.00

DIVISION OF CONSERVATION EDUCATION AND COMMUNICATIONS

Conservation Education and Communications Advisory Committee

Marion Burnside, Chairman Hopkins
A. Pinckney Skinner, III Florence
Carolyn Fair Randolph Columbia
Robert E. Livingston, III Newberry
Charles L. Wyrick, Jr. Charleston
William R. "Buddy" Jennings Chapin
Lorraine R. Conrad Columbia
Jessie D. McCollough Kingstree

The Division of Conservation Education and Communications (CEC) with offices in Columbia and Charleston is staffed by 37 full-time personnel supporting all divisions and programs of the S.C. Department of Natural Resources. The division's goal is to assure that information and education efforts are the result of proper planning and coordination, keeping in mind the needs of public, agency goals, cost-effectiveness, thorough review, accuracy and professional standards.

CEC provides the following agency-wide services: conservation education, Hooked On Fishing Not On Drugs program coordination, publication advisement, coordination and design, art and graphics, duplicating services, agency mail room, *South Carolina Wildlife* magazine production, marketing and fulfillment, magazine product marketing, still photography, RESPECT outdoor ethics campaign, agency news releases, weekly fishing trend reports, news media assistance, spokesperson services, video production (training, documentary, public service announcements), video library (free loan instate), writing and editing, *S.C. Natural Resources* newspaper, and freshwater fishing records.

"HOOKED ON FISHING NOT ON DRUGS" PROGRAM

The "Hooked on Fishing Not on Drugs" (HOFNOD) program offers a sound purpose and a strong environmental message. Participating in this program offers South Carolina's youth an opportunity to experience an education in natural resources and an alternative to drug use.

Funding and distribution of promotional items is coordinated through the Conservation Education and Communications' administrative office. In February 1996, the Harry Hampton Memorial Wildlife Fund Board of Directors approved the allocation of \$4,392 for the HOFNOD program. These funds were used to purchase promotional items for rodeos being held in eight of the South Carolina Department of Natural Resources' law enforcement districts. An additional \$1,000 was allocated to each law enforcement district to help in operational costs. Seventeen department-sponsored rodeos were held throughout the state. The department co-sponsored with other state agencies and outside organizations approximately 15 other fishing events, lending assistance in manpower, coordination and promotional items. Promotional items were also used to assist law enforcement and education staff in promoting the HOFNOD program at schools and other outside organizations. These rodeos and other events helped to reach over 25,000 young people and adults with the HOFNOD message during 1996.

Department staff continue to seek other funding sources through state and federal grants.

MEDIA SERVICES

Established a credible and professional relationship with the media (radio, TV, Newspaper). Served as primary agency spokesperson in several law enforcement emergency response operations including a number of boating accidents, boating related fatalities, drownings, and search recovery & rescue operations, as well as other SCDNR activities and events.

Made personal visits to every major media outlet in the state.

Implemented new (more proactive) system of communicating SCDNR activities (law enforcement & other newsworthy events, etc.). Improved methods of media communication include enhanced use of cell phone and remote facsimile capability.

Served as spokesman for the state, EPD and DNR during the approach of two major hurricanes, Fran and Bertha.

Worked to gain greater media participation and public awareness of the following special events. Marine Fishing Fair -- MRD, Becoming an Outdoors Woman -- Agency Wide, Palmetto Sportsmen's Classic -- Agency Wide, National Hunting and Fishing Day -- WFF, National Fishing Week/ Free Fishing Days -- WFF.

Planned and implemented media events or news conferences for B-SAF (Boating Safety Action Force) -- Law Enforcement, Adopt-A-Landing -- Water Resources, National Fishing Week/ Free Fishing Days Media Tournament -- Agency Wide.

Awareness Committee

- Developed two Public Information Campaigns for radio on Compact Disc. CD is mailed quarterly to every radio station in the state. High success rate of getting SCDNR Public Service Announcements on-the-air is evident by frequent air-play in all regions of the state.

- Produced Citizens Guide to the DNR.

- Developed Employee Assistance Manual.

- Conducted five media relations training classes. Sixty DNR employees have completed the program.

- Established agency wide calendar of events. Agency calendar continues to be updated and developed.

- Compiled collective list of all agency publications currently in print.

- Streamlined and simplified agency publications procedures.

- Working with Office of Human Resources, conducted two Awareness Training workshops.

- Developed and utilized DNR slogan, Working for you, naturally.

EDUCATION SECTION

The Education section plans, directs, and coordinates a comprehensive wildlife education, which teaches the ecological principles of our natural resources to the citizens of South Carolina. These programs have received awards on both the national and state level for their effectiveness and efficiency. Evaluation and personal service to teachers, families, and other individuals who work with youth are the essence of the conservation programs. The following programs are administered by this division:

Project WILD-Project WILD is a national award-winning interdisciplinary environmental and conservation education program of instructional workshops and supplementary curriculum materials for teachers of K-12. Each participant receives the Project WILD Activity Guide which contains over 100 activities. Workshops are six hours in length with a minimum of 15 participants. There is no charge for the program. In the 1995-1996 school year, staff conducted approximately 90 Project WILD workshops with over 2500 participants. Over 23,000 teachers have attended workshops since 1984.

Aquatic WILD-A continuation of the Project WILD program, Aquatic WILD emphasizes aquatic wildlife and aquatic ecosystems. Each participant receives the Aquatic WILD Activity Guide with over 40 activities. Workshops are four hours in length with a minimum of 15 participants. There is no charge for the program. In the 1995-1996 school year, staff conducted 21 Aquatic WILD workshops with over 700 participants.

Conservation Education Programs-Designed to introduce students to the Department of Natural Resources, this program involves the use of live animals and enhance any curriculum. There is a \$30 charge for these programs. This program is very popular and staff cannot meet all

of the requests received. Conservation Education Programs reached over 80,000 persons and could easily reach over 100,000 with additional staff .

Camp Wildwood-Camp Wildwood is designed for high school students who enjoy being out-of-doors and strives to increase their knowledge and experience in natural resources management. Located at Kings Mountain State Park about fifteen miles northeast of York, SC, Camp Wildwood is open to all tenth (must have completed ninth grade prior to camp) through twelfth grade high school students. Enrollment is limited to one-hundred campers. A camper may enroll through sponsorship by a local chapter of the South Carolina Garden Club and The South Carolina Wildlife Federation. A camper may also self-enroll if the parent or guardian so chooses. Sponsorship usually includes payment of the camp fee by the sponsoring organization. In addition, a limited number of scholarships are available from both organizations at the state level. Camp Wildwood is reaching 125 campers participating per year.

Whale Program-This program uses math, art, language arts and other subjects to introduce students to whales. Instructor provides information on whales and helps students construct a Blue Whale to scale. Cost of construction averages \$150. There is a \$30 charge for student groups, no charge for teacher groups. The Whale Program is reaching 1000 participating per year.

KATE-Designed for students in grades fifth through eighth. KATE provides a true comprehensive education camping program that is changing the way they think about the environment. This is accomplished through camps (three days, two nights) at two locations within the state. This program has already reached over 7,000 children in just three short years. The South Carolina Department of Natural Resources is a coalition member who supports the program financially, trains staff and serves by representation on the advisory board.

Junior Duck Stamp Contest-The South Carolina Department of Natural Resources and the Southeastern Wildlife Exposition sponsors the Junior Duck Stamp contest annually. This contest enables students grades K-12 to express their feelings of natural resources through art, however, the drawings are limited to ducks, geese, or swans. This conservation education contest goes on to compete nationally with other local winners from differing areas, and from that competition a winning entry will be selected to be transformed from a drawing to a stamp.

SC MAPS-An innovative curriculum that covers issues dealing with South Carolina's geological foundation, historical events, folklore, storytelling, mathematical skills, environmental concerns, and cultural development through the use of maps. This program enables students to learn visually as well as interactively with familiar land around them. SC MAPS has been adopted by the DNR Division Directors as a Department Education Program as well as having continued support by the Department of Education. Staff training has been conducted and workshops are being planned for the 1996-1997 school year. A brochure has been created and an exhibit is being planned.

NEWS AND VIDEO SECTION

PURPOSE: The News and Video Section provides overall news media and video production services to all divisions of the agency and its cooperative projects with other government agencies, public utilities, organizations and private companies. It serves the public through timely and widespread dissemination of needed information.

Through news releases, video/audio productions, and the Internet, the section's purposes are to: Inform and educate the public about the condition and value of South Carolina's natural resources; Encourage ethical and safe conduct afield among outdoors enthusiasts; Inform constituents of agency services, application deadlines and points of delivery; Provide information on outdoor recreational opportunities; Inform constituents of meetings, pending department actions and opportunities for public input; and Update the public on state and federal laws and regulations.

STAFFING: At the close of Fiscal Year 1995-96 the News and Video Section had a staff of 8 in two offices in Columbia (headquarters) and Charleston. Staff provided services agency-wide in support of all divisions and responded to inquiries from the public and the news media. In March a vacant public affairs position was filled to cover Land and Water Resources divisions. The section chief participated in interviews to fill a public affairs position in Wildlife and Freshwater Fisheries.

VIDEO PRODUCTION: The section's video unit provides cost-effective in-house production of public service announcements, natural resource documentaries, staff training videos, natural resources footage for television news programs, and footage for cooperative projects with other government agencies and organizations. Staff support video/audio needs of agency functions such as meetings, workshops and media training sessions

Video Library: A video/film library is maintained offering a list of department productions on free loan to the public, agency staff, organizations, and other state agencies. Each law enforcement district office and some wildlife field offices maintain a set of library videos. A duplicate set of department films and videos is available on free loan to teachers from the Audiovisual Library of the S.C. Department of Education in Columbia and updated annually.

Public Service Announcements: During FY 1995-96 television spots were produced on: Free Fishing Days (June 8-9); the bald eagle license plate; 1996 Marine Fishing Fair; Hurricane Preparedness (three); and the new Boating Safety Action Force (June 6 news conference). Staff worked with new agency spokesman to plan and write a quarterly package of radio PSA's for all seven divisions. The first compact disc was completed in April with eight radio PSA's, including dove field planting, free fishing days, Land Resources map center, beach sweep-river sweep, South Carolina Wildlife magazine, shrimp baiting, bald eagle license plant and wearing international orange during deer season.

Training, Educational and Documentary Videos: The following projects were completed: a major educational and historical video (45 minutes) on the Tom Yawkey Center in Georgetown County; the F.A.C.E. (Food And Cover Establishment) For Wildlife program video which promotes the planting of wildlife food plots by 4-H members and other youths (Copies distributed to all 46 Clemson Extension offices); the Marine Center Tour Video; the agency orientation video; audio tracks for Marine Center exhibits; an audio track for the Life in the Salt Marsh CD-ROM; aerial trout stocking video; Becoming An Outdoors Woman video; Jocassee Gorges land acquisition project video; and Camp Wildwood . Work was begun on a backyard birds video for Wildlife Diversity Programs and a video on planting legal dove fields for the Small Game Project.

Nature and Department Footage: The Video Unit taped the following subjects and events: Marine Resources oyster reef study; Buzzard Roost Heritage Preserve dedication; fish kill below Lake Murray dam, Students Teaching Students Program at Donnelley WMA and Marine Center; Water Resources educational program with deep drill core at Webber Elementary; Enoree Waterfowl Management Area; striped bass fishing at Lake Wateree; dove hunting at Bishopville; Outdoors Woman Workshop at Camp Bob Cooper Sept. 29 - Oct. 1; testing of officer applicants at Criminal Justice Academy; long-lining for sharks, wetland construction sites, offshore sampling and marine lab work; agency's first aerial first trout stocking on the Saluda river (Provided footage to WIS news); new educational displays at the Marine Center; youth coon hunt at Webb Center; Raven Cliff and Station Falls; nesting ospreys at Santee Cooper lakes; major oil spill investigation and clean-up on the Reedy River; trail dedication at Lake Edgar Brown; and the boat landing cleanup at Saluda River for the Adopt-A-Boat-Ramp program.

NEWS RELEASES: The news release program provides a timely means of communication with print and electronic news media covering South Carolina; with the department's field staff, particularly natural resources officers; other state, regional and federal conservation agencies; and the state's conservation organizations. .

Weekly News Package: A total of 274 news releases and media notices were published during FY 1995-96 with a weekly distribution list of 750 (in-house and outside of agency). The weekly package of prioritized articles, freshwater and saltwater fishing trends and state timetable is distributed within all agency divisions and sent to 22 daily newspapers; 115 non-daily papers; 103 radio stations; 29 television stations; 28 magazines; 3 news services; 15 feature writers; 11 outdoor writers; DNR staff, enforcement officers, board and advisory committee members; 34 conservation groups and 12 PRT Welcome Centers.

News Cost Savings: Reducing the costs of materials, operation and production, while maintaining quality and effectiveness, is an ongoing section effort. Mailing lists for news releases and the department newspaper are updated and monitored weekly. The weekly news release package is printed in-house using both paper surfaces with a two-page article length limit and an overall size limit of nine sheets to limit production costs. A one-page summary is sent to most radio and television station news directors. Photographs are mailed to individual media only as requested.

News Via Modem and Internet: To make department news and information more accessible to the public while limiting costs, existing telephone lines and computers are used to publish news releases and fishing reports on the Internet via the agency's World Wide Web home page in the Water Resources Division. News releases are also sent weekly by direct modem transfer to nine major daily news papers - The State, The Greenville News, the Anderson Independent-Mail, The (Rock Hill) Herald-Journal, The (Myrtle Beach) Sun-News, The (Spartanburg) Herald-Journal, The (Orangeburg) Times and Democrat, and The (Charleston) Post-Courier. A one-page news summary is modemed to Associated Press headquarters in Columbia in addition to inland and marine fishing reports which are relayed to all subscribing media. WIS-TV publishes the fishing trends report as a regular feature on the Saturday 9 a.m. news show. Most of the state's newspapers feature the reports weekly.

MEDIA ASSISTANCE: The section wrote a media statement for agency legal office about a case challenging upstate ban on big game hunting between seasons and coordinated response to media inquiries. Information was provided to the Charleston Post-Courier on the economic impact of hunting in S.C., which resulted in a balanced news article by business editor John McDermott. Staff coordinated the responses to Greenville News Columbia Bureau inquiry about state agencies' printing efficiency study and the agency's "low" rating; an inquiry about department aircraft; and an inquiry about federal drug testing of commercial drivers in the agency. The section promoted the board's decision to eliminate dove hunting over top sown grain. Staff assisted Lee Harter of the Orangeburg Times and Democrat with annual hunting section by providing news release subject index and modeming articles requested. Area media coverage was coordinated during the hunt ban in the flooded Congaree Swamp. The section sent news releases and photos about interns with the Marine Resources Minority Training Program to hometown media. Section writers and video unit coordinated media coverage of the drill core educational program with Water Resources staff and a USGS at Webber Elementary School. Staff assisted "Living In South Carolina Magazine" with photos for feature articles adapted from news releases. The section responded to many media calls when a cougar escaped from a private zoo in the Pee Dee area. Staff wrote releases and answered media inquiries in connection with a March law enforcement raid on a Greenville County fox-coyote pen. The section drafted an agency statement about the Sandy Island Mitigation Plan. Staff worked with Wildlife and Freshwater Fisheries personnel to write monthly update articles on Lake Russell pump-back testing. The section assisted WIS television with December stories on the economic impact of hunting and the Sunday hunting court cases. The section coordinated with news media and agency staff on extended coverage of a major oil spill and clean-up on the Reedy River in June.

DEPARTMENT NEWSPAPER: S.C. Natural Resources newspaper, formerly The Resource,

has been mailed free to state residents annually or semiannually since 1979. The summer 1995 issue was printed (70,000 copies) and mailed free in early July to 61,648 S.C. residents. The list included Resources subscribers, \$9 lifetime licenseholders, \$500 lifetime licenseholders, and agency employees with the rest of the list filled from Sportsman's licenseholders and marine recreational fisheries stamp purchasers. Duplicates were purged by Social Security number. Printing and presort cost 14.7 cents each (\$10,309.85); postage was \$13,483.98 (21.9 cents each). This was less than the \$25,000 cost forecast. Initial supplies were delivered to all divisions and a mailing was made to the S.C. General Assembly with labels provided by Legislative Information Systems. Remaining copies were distributed by agency staff during meetings, exhibits, fairs, workshops and presentations.

COOPERATIVE PROJECTS:

South Carolina Fishing Hotline: The 1-800-ASK-FISH toll-free fishing hotline - which started on Oct. 5, 1994 - had a second successful year. Updated weekly with the department's weekly fishing trend reports, the fishing hotline provided callers across the nation with valuable information about fishing opportunities in this state such as lake descriptions, frequently asked questions, license dealers, boat ramps, subscription details for South Carolina Wildlife magazine and statewide Hooked On Fishing Not On Drugs fishing rodeo schedule. This highly successful federally funded hotline is sponsored by the department and the Sportfishing Promotion Council. Associated Press, which weekly sends DNR fishing reports to its subscribers, agreed to start advertising the 1-800 number in its reports. The State newspaper prints the report in its entirety in each Friday's Sports Section.

Lexington Library Fishing Loaner Program: Staff promoted the Lexington County Library fishing gear free loan program which began in March 1995 as a joint effort of the S. C. Department and local bass fishing clubs who maintain the equipment. Nine libraries currently loan out the tackle.

State Parks Fishing Loaner Program: Staff promoted the state parks fishing loaner program, which began July 13, 1995. Video footage of the kickoff at Andrew Jackson State Park was supplied to three major TV stations in Columbia which all aired segments. The cooperative fishing equipment free loan program available at four state parks - is a joint effort of the S. C. Department of Parks, Recreation and Tourism, the S.C. Department of Natural Resources and local bass fishing clubs who maintain the equipment. This effort is also supported by The National Sportfishing Promotion Council, Silstar Corp. and Shakespeare.

Becoming An Outdoors-Woman: Section staff assisted the Wildlife and Freshwater Fisheries Division and later in the year coordinated the agency's "Becoming An Outdoors-Woman" program for South Carolina. This involved attending meetings and training workshops, seeking funding and planning for a South Carolina workshop held Sept. 29 - Oct. 1 at Camp Bob Cooper on Lake Marion. Planning, including a search for sponsors and instructors, began for the planned August 23-25, 1996 workshop at Clemson. Staff gained the sponsorship of Perception Kayaks in Easley, the world's largest kayak manufacturer.

Wildlife Diversity Programs: Staff promoted the state's Wildlife Diversity Programs through the fifth annual holiday news package; slide programs; and coordination of preserve dedications with local news media. Dedications and field trips were coordinated with news media and local legislators at Buzzard Roost Heritage Preserve (July), addition to Waccamaw River Heritage Preserve (August), Brasstown Creek Heritage Preserve (January); and Gopher Branch Heritage Preserve (April). At the request of PRT a package of slides and information was assembled on ACE Basin, Cape Romain, Mountain Bridge and Carolina bays for Outside magazine and possible South Carolina "destination" stories. Staff did planning, research, shooting, script writing and editing for video on the upcoming land acquisition of Duke mountain properties, called "Jocassee Gorges." The video unit accomplished much work in shooting footage for a video on attracting

backyard birds. The sixth annual Wildlife Diversity-Heritage Trust news package was completed for Christmas holiday distribution.

Internet: The section worked with the Water Resources Division in expanding and improving the department's Internet home page. Current news releases, fishing reports, tidetables and other information were edited and formatted weekly for home page use. Staff edited and formatted the annual Public Dove Fields list prepared by Wildlife and Freshwater Fisheries for posting on the agency's home page for Internet users.

South Carolina Wildlife magazine: Section staff provided editorial, research and photographic assistance to South Carolina Wildlife magazine through writing of feature, At Your Service, and Roundtable articles and coordinating with other agency divisions. Staff written articles include: Value of longleaf pine in reforestation; the big picture of natural resources officers work; Congaree National Monument; watercraft safety and personal watercraft; and others. Staff assisted with Palmetto Portraits calendar, providing wildflower lists, photos and copy on attracting butterflies and hummingbirds.

Agency Awareness Committee: The section chief chaired some initial meetings in early 1996 and worked with all divisions to develop a "Citizen's Guide to SCDNR Services" which had been approved and was ready for printing at year's end. Staff also edited the "most frequently asked questions" section of the new employee telephone directory.

Freshwater Fishing Records: The section maintained and promoted the state's freshwater sportfishing bowfishing records programs gaining new records: 7-pound, 12-ounce spotted bass July 29; an 8-pound, 2-ounce spotted bass at Lake Jocasee April 18; and a 39-pound, 6-ounce carp bowfishing record at Lake Murray April 2.

National Hunter Safety Video Public Service Announcement - The section assisted the U.S. Fish and Wildlife Service in editing, compiling television station lists and providing video for a nationally distributed hunter safety public service announcement, localized with each state's point of contact.

GRAPHICS AND DUPLICATING SECTION

The Graphics and Duplicating Section include the Graphic Design unit, the Duplicating Center and Mail Room, and acts as the agency's coordinator for all publications. All mail, in-house duplicating, graphic design and outside printing is coordinated through this section on a large variety of assignments that include all publications for the department except South Carolina Wildlife magazine and certain special projects or technical reports that are assigned to other sections. This section processes work through requests from each division and is coordinated through the Awareness Committee. Once a project is approved, work is completed by direct interaction with the requestor, or writer, of the project.

The overall supervision of the section is the responsibility of the Project Administrator. In the Graphics Design unit, the Publications Coordinator provides day-to-day supervision of all art work and printed documents as well as defines job specifications for procurement. The Assistant Publications Coordinator is responsible for editing, proofing, verifying and coordinating internal work flow. In addition to these positions, this unit includes three graphic artists all of whom assist in the production of agency publications and special projects. Two hundred fifty jobs were produced by this unit. Two second place awards were received from the Association for Conservation Information for the Palmetto Portraits calendar and the Life in the Saltmarsh poster, guide and CD. Additionally, the Palmetto Portraits calendar won the Blue Pencil Award given by the National Association of Governmental Communicators. The Duplicating Center and Mail Room is staffed by three full time employees and one hourly employee. Duties include all in-house duplicating, mail processing/distribution, and courier services. Staff processed approximately \$222,000 in postage and ran over 3.5 million impressions on its AB Dick presses.

The objective of the section is to produce and distribute all necessary publications to the

agency for: 1) Management, research and law enforcement goals, 2) Protecting and enhancing resources and habitat, and 3) Providing wildlife and fishing and general natural resources enjoyment. Since the Department is required to produce and distribute information regarding hunting and fishing Rules and Regulations and the use of Wildlife Management Areas, this section prepares and updates any publications affecting those activities in the state. Typical of such publications are the annual combined Hunting and Fishing Rules and Regulations, Turkey Hunting Regulations, the Migratory Bird Regulations and the Wildlife Management Area maps that require updating each year. The section also produces a wide variety of general information on individual wildlife species, management and research facilities, game management techniques, conservation, education, fishing, boating, and recreational outdoor sporting activities.

MAGAZINE SECTION

Magazine section's primary function is promotion and publication of South Carolina Wildlife, the agency's nationally recognized bimonthly conservation magazine, the flagship educational and public relations tool of the Conservation Education and Communications Division. South Carolina Wildlife informs the public of the value of the state's natural resources while acquainting them with the agency's programs protecting and managing these resources that affect our quality of life.

Featuring articles on outdoor activities, natural and scenic areas, character profiles, conservation issues, wildlife-watching, outdoor humor, and news, South Carolina Wildlife also extolls the natural resources of our state and promote its historical and cultural values, encouraging tourism and visitation through such articles as "Chauga: One Of A Kind" (urging both visitors and residents to discover the unique natural world of our mountains) and "Second Season" (a seasonal look South Carolina's fall beaches).

SCW increased its efforts to support the program known as SC MAPS, an imaginative approach to teaching about South Carolina's natural resources and their shaping of the state's history. SCW provides to teachers packets of mini-magazines that supplemented their classroom use of SC MAPS manuals, large, laminated high-altitude and satellite infrared lithographs, and topographic and special-purpose maps. This popular cross-curricular program uses a hands-on approach to teaching students the unique nature of South Carolina's natural resources and encourages their awareness of the need to conserve and protect these resources.

In addition to this inter-agency cooperative effort, SCW also continued to work with S.C. Parks, Recreation and Tourism and other state and local agencies to seek mutually supportive methods of promoting public awareness of the state's diverse features and outdoor recreation opportunities. Articles such as "Christmas In The Parks" promote our state parks' programs.

South Carolina Wildlife again brought recognition to the agency and the Palmetto State for excellence in photography, writing and design through its participation in national competitions. The publication was again named one of the top conservation magazines in North America by the Association for Conservation Information, which brings together journalists and educators from state and federal wildlife agencies nationwide. SCW also won the ACI's first-place awards for its articles and photography, and took a second and first place in National Government Communicators competition for magazine and calendars, and five second places for articles and design from the International Regional Magazine Publishers Association (IRMA).

Editorial and marketing/promotions planning moved forward, with staff continuing a 12- to 15-month advance schedule. Circulation of South Carolina Wildlife continued to average approximately 60,000 subscribers, reaching almost 15 percent of South Carolina households. The magazine is provided free to all South Carolina libraries and schools. New marketing efforts again centered on a cash acknowledgment renewal program to help improve renewal response.

Introduction of new byproducts and aggressive marketing brought increased revenues to

supplement the magazine's educational efforts — some 100 percent during November 1996 as compared to November 1995. The best-selling "Palmetto Portraits" and the "Sportsman's Calendar and Almanac" were again sold out. New magazine byproducts included sporting series and nature series T-shirts, Tides and Times, and identification posters for freshwater and saltwater fish. Combination sets of byproducts were test-marketed and proved successful. New book titles, fulfilled through Sandlapper Press, were introduced. New-product development for 1996-97 began with test sales of products during the holiday season.

An agreement was reached with S.C. Parks, Recreation and Tourism whereby SCW products were sold through PRT's park stores and gift shops. Wholesale marketing to retail locations was continued, with ten stores again carrying SCW merchandise.

Magazine section photography staff, whose primary responsibility is to fulfill assignments for illustrating articles published in the magazine, are also responsible for all still photography used by the agency and regularly provide photo support and expertise to other divisions and agencies.

Design and layout of the magazine were fully converted to computer disc. Computer typesetting for the agency continued to channel through this section, with editorial and graphics staff advising, proofing and consulting on various special publication projects. Staff also assisted with other special responsibilities, such as the agency's RESPECT (outdoor ethics) program, the Governor's Cup Billfishing Tournament Series, the Palmetto Sportsmen's Classic, and the department exhibit. Staff also participated in numerous DNR Strategic Planning sessions, editing and rewriting the agency's strategic plan.

With the ongoing support and counsel of the DNR Board and the CEC Advisory Committee, South Carolina Wildlife magazine continues its tradition as South Carolina's magazine, one that represents the best interests of the natural Palmetto State to a diverse audience of both in-state and out-of-state readers.

GEOLOGICAL SURVEY

The past year was in many aspects a transition period for the South Carolina Geological Survey. This transition period was the result of the Geological Survey becoming part of the Department of Natural Resources, hiring of a new State/Chief Geologist, and reassigning of work responsibilities. Reassignment of work responsibilities was for a number of reasons, but this action was primarily driven by the new mission statement of the Geological Survey. This statement defines that the Geological Survey within the Department of Natural Resources will provide a service-oriented program. Under this service-oriented program, the Geological Survey will collect study, interpret, and report all information which pertains to the geology and mineral resources affecting the daily lives of the citizens of the State.

Driven by this mission statement, selection of projects and prioritization of those projects was based on the identification of how great a risk or environmental concern was posed by a particular situation. Analyzing the potential of earthquake hazard was given a high priority. This priority was based on the relation that earthquake damage in particular areas could have a long term economic impact on a region, as well as result in devaluation of property and possibly public default on debts. Rapid growth areas were also given a high priority because of the immediate environmental concerns. Protection of watersheds, delineation of faults zones, and depletion of local, non-renewable resources are great concerns in these rapid growth areas. Areas where toxic waste is stored or concentrated in landfills was also given a high priority because the health and safety of citizens could be affected.

After identification of priorities and arrangement of these priorities into programs, a number of other steps were taken. One of these planned steps was to produce a series of General Geology Maps in a relatively short time. Maps in this series include the following: 1) Geologic Map of South Carolina, 2) Earthquake Hazards Map, 3) Structural Geology Map, 4) Structural Lineament Map, 5) Mineral Resources Map, and 6) Stratigraphic Chart of the Coastal Plain. Arthur (Butch) Maybin III was given the responsibility of developing the Geologic Map of South Carolina. Mr. Maybin, with the assistance of Paul Nystrom, completed this map and the map was published in the Fall of 1995. Mr. Maybin was also given the responsibility of developing the Mineral Resource Map which he completed in the Spring of 1996. Mr. Maybin then began work on the Structural Geology Map, and work continues on that map at the present time. However, the need for field checking and remapping of particular areas, verses simple compilation of available maps, has slowed the construction of the map. Mr. Nystrom took on the responsibilities of developing the Earthquake Hazard Map; the Hazard Map for the Coastal Plain of South Carolina was completed in the Spring of 1996 with a small grant of \$7500.00 from the Emergency Preparedness Division. Ralph Willoughby reviewed the available information and constructed a preliminary working chart of the stratigraphy of the Coastal Plain. This chart is presently a work-in-progress since different units on the chart are being reviewed and revised.

The basic work of the Geological Survey continued as the General Map Series was being developed. Clark Niewendorp, who was the Principal Investigator of the Statemap Program during the period, supervised the completion of six (6) 7.5-mineral quadrangle geology maps and saw that these maps were placed on Open File at the Geological Survey. Mr. Niewendorp personally completed three (3) of these maps, as well as a special project for Land Resources Division which involved the geologic mapping of Lynch Woods Park (Education Program). Mr. Niewendorp was also instrumental in developing a new Statemap grant for which the Geological Survey has received \$116,000.00. Mr. Nystrom completed the Long Branch 7.5-minute quadrangle geology map which is part of the Savannah River Site project (Toxic Waste Problems priority, Land Use program). He also began mapping Newberry West 7.5-minute quadrangle in the Piedmont to assist in the development of the General Map Series Structural Geology Map.

Mr. Willoughby completed the Windsor 7.5-minute quadrangle geology map as part of the Savannah River Site Project and began work on the Girard NE 7.5-minute quadrangle. A number of new auger holes were drilled to complete this work, as well as a number of cuts were re-exposed and re-examined for evidence of faulting. Mr. Maybin took on the mapping of Simpsonville 7.5-minute quadrangle as part of the Land Use program, and a preliminary draft of this geology map was completed by 1 June.

With completion of his Statemap responsibilities, Mr. Niewendorp began re-mapping the structural geology around Lake Murray as part of the Earthquake Hazards program. He completed a reconnaissance of the area and mapped the spillway of Lake Murray Dam in detail. The need for detail maps was dictated by the subtle character of faulting which was identified during the mapping of Laurens North 7.5-minute quadrangle under the Statemap project.

Mr. Niewendorp's urban or "backyard" mapping dictated that the Geological Survey adopt a pseudo-uniform so that housewives would not be alarmed by strangers wandering about on their property. A second patch identifying personnel as working with the Geological Survey was sown onto the utility shirts for this purpose. Funds were also available to purchase new boots, and different individuals are now wearing their second pair.

Besides the mapping the Geological Survey conducted an active classroom and teacher-workshop Education Program. Mr. Niewendorp was initially responsible for most of this work, but the bulk of the presentations and workshops were taken over by Mr. Willoughby. Most of these presentations are at either the elementary or middle school level. A general in-house workshop on the style and content of geology presentations was also given to CEC personnel. As part of the Education program, Gary Taylor also presented a number of classroom presentations to minority students and became involved in the Upward Bound Program.

In the continuing education area, Mr. Nystrom and Mr. Willoughby prepared abstracts and presented poster sessions on the geology of individual 7.5-minute quadrangles of the Savannah River site at the Southeast Section of Geological Society of America held in Jackson, Mississippi. These gentlemen also attended the Central United States Earthquake Consortium annual meeting and workshop in Memphis, Tennessee. Mr. Maybin attended a Penrose conference workshop on faulting held in Washington state to assist him in the development of the General Map Series Structural Geology Map.

The work which was conducted during the past year was completed with the realization that applied geologic map products from the Geological Survey serve as the foundation of many government programs. Ecosystem management, non-renewable natural resource conservation, proper land use, and environmental protection are dependent on this fundamental geologic data base. Besides the basic work and an expanded agenda in hazards and land use, the Geological Survey is now evaluating moving into Coastal geology as the Unit continues to develop a unique capability to serve directly the geologic needs of the State.

LAND RESOURCES AND CONSERVATION DISTRICTS DIVISION

Land Resources and Conservation Districts Advisory Committee

William S. Simpson III, Chairman	James Island
Thomas E. Garrison III	Pendleton
Roger Leaks, Jr.	Columbia
Glenn C. Alexander	Van Wyck
Patricia C. Edmonds	Greenwood
Elizabeth Dunlap Rhea	Rock Hill
Larry E. Nates	Gaston
Charles R. Snow	Chapin
J. Chalmers Dial	Moncks Corner
Webb M. Smathers, Jr. Ph.D	Clemson

ASSISTANCE TO LANDOWNERS AND USERS - During FY 1995-96, 819 staff days of technical assistance were provided by Division staff through conservation districts. Technical duties of staff include assisting conservation districts with planning and installation of soil and water conservation practices (including land treatment watershed projects and implementation of the Clean Water Act), monitoring erosion, sediment and storm water problems, and demonstration of conservation tillage and drip irrigation . Through conservation programs in the districts more than \$2.86 million in federal cost share assistance has been provided. In addition to cost share dollars, annual rental payments to landowners enrolled in the Conservation Reserve Program will total an estimated 11.5 million for the 269,531 acres placed in the program. 69.3 percent of the total acres of cropland and pasture in the state has adequate soil and water conservation management. There are 35,973 conservation district cooperators and the total acres in South Carolina placed under conservation plans through conservation districts is over 6.67 million.

COMPUTER NETWORK -The Division expanded its computer network into a floor-wide local area network (LAN), enabling personal computers to share files, printers, and other resources. The LAN was then connected to the Office of Information Resources' Columbia MetroNet and, thereby, to the Internet, providing e-mail and access to the expanding information sources on the World Wide Web.

CONSERVATION TILLAGE DEMONSTRATION PROGRAM - The Conservation Tillage program demonstrates an innovative approach to promote the adoption of emerging conservation tillage technology to conserve energy, save time and money, reduce soil erosion and improve water quality. Conservation tillage equipment (no-till drills, planters, and drip irrigation machines) is made available to the general public through the conservation districts. This program allows land users to test for themselves this proven conservation technology before investing in the equipment. In 1996, the total acres using conservation tillage in South Carolina exceeded 318,581 acres, a forty per cent increase over the previous year. The equipment provided through conservation districts contributed to this increased acreage. The Division sponsored field days and demonstrations jointly with conservation districts and with assistance from other federal, state, and private agencies.

CONSERVATION DISTRICT COMMISSIONER AND WATERSHED DIRECTOR ASSISTANCE - The Division provides administrative and technical assistance in the implementation of the Soil and Water Conservation Districts Law and the Watershed Conservation Districts Law. Division staff attended over 700 conservation district board meetings, watershed district meetings and training sessions providing direct assistance to the district commissioners,

watershed directors, district employees and other citizens. There are 37 Watershed Conservation Districts in the state with a combined total of 1,232,654 acres. Division staff provided direct assistance such as training watershed directors and providing administrative assistance. Staff conducted 17 training sessions in FY 96 for watershed districts.

ENVIRONMENTAL EDUCATION INSTITUTES FOR TEACHERS - The Division, in cooperation with conservation districts, co-sponsored thirteen (13) Environmental Education Institutes for Teachers. The Institutes were held in cooperation with local school districts and covered many topics related to environmental education. These Institutes offered teachers an excellent opportunity to learn about the environment and conservation education services available to the community. Over 350 teachers participated in the environmental institutes and earned re-certification or graduate credit.

TEACHING KIDS ABOUT THE ENVIRONMENT (KATE) - Division staff provided assistance in the development and implementation of this program, produced curriculum for the soils portion of the program, and provided training for instructors to teach the soils portion of the program. The KATE program emphasizes the interrelationship of soils, water, forests and wildlife. 19,514 students participated in the program in FY 1995-96 KATE also conducted a two-week post graduate workshop for teachers on the KATE Curriculum. The Teaching KATE Coalition is a unique approach to natural resource education utilizing the collective talents and resources of public and private agencies and businesses.

CONSERVATION WORKSHOP FOR YOUTH - Staff of the Division conducted the annual conservation workshop which is held on the Clemson University campus. One hundred high school students from across the state attend the week-long activity. The participating youth are sponsored by their local conservation district. During the workshop, the youth were informed of the importance of land and related natural resource conservation and were prepared to serve as youth commissioners in their local districts. Six scholarships were awarded to participants who excelled in workshop activities.

BARRIER ISLAND COASTAL ENVIRONMENTAL WORKSHOP - The Barrier Island Coastal Workshop, held at Camp St. Christopher, south of Charleston, is a weekend workshop for high school students to study the coastal environment. The workshop includes sessions on ocean life, beach formation, marsh and wetland ecology. Participating students are sponsored by their local conservation district. The Workshop is coordinated by Division staff.

STATE CONSERVATION SPEAKING CONTEST - Conservation Districts held local conservation speaking contests in preparation for the four area speaking contests which were held at various locations around the state. The Conservation Speaking Contest is open to all students in grades 9 through 12. The topic for 1995-96 contest was "Wildlife and People". The four area winners competed for the state award at the South Carolina Association of Conservation Districts Conference in January.

ESSAY CONTEST - This annual statewide contest is sponsored by the Department through the 46 conservation districts for grades 5-8. The 95-96 theme was "Wildlife and People". The Division staff obtained the services of the SC State Library to prepare a bibliography of wildlife reference publications and provided the bibliography to conservation districts for use with schools. Participating students write approximately 35,000 essays each year in the conservation essay contest.

POSTER CONTEST - This annual statewide contest is sponsored by DNR through the conservation districts and school districts for grades K-4 each spring. The 95-96 theme was "Save Habitat for Our Wildlife Friends". The creation of the poster is a class project designed to promote the benefits of group effort and participation. This competition is conducted in cooperation with the South Carolina Wildlife Federation. Winning posters are placed on exhibit at the SC State Museum in Columbia.

EDUCATION AND PUBLIC INFORMATION PROGRAMS - Division staff and conservation districts conduct an extensive education and public information program on natural resource conservation. With a network of forty-six offices, one in each county, the conservation districts make available timely and important information to the public. During FY 95-96, the Division and conservation districts have reached over 400,000 citizens through various methods such as news releases, workshops, exhibits, classroom presentations, and demonstrations.

AWARDS - The Agency recognized the achievements of individuals and businesses that have been good stewards of our natural resources through awards and recognition programs such as the **Clean Water Farmer Award, Land Development Stewardship Award, Outstanding Conservation Teacher Awards, and the Outstanding Conservation District Commissioner Award.** The **Beaufort Conservation District** has been named second place recipient of the Southeastern Regional Award for Conservation Education by the National Association of Conservation Districts (NACD).

CONSERVATION PARTNERSHIP CONFERENCE - The 1996 Joint Conference of the SC Association of Conservation Districts, USDA-Natural Resources Conservation Service and Land Resources and Conservation Districts Division of SCDNR was held January 4, 5, and 6 at the Charleston Place Hotel. The conference was attended by over four hundred conservation leaders from across the state.

The conference theme, **"Partnership-Natural Resources-Quality"**, focused on the role each person plays in delivering a quality service through the Conservation Partnership between the DNR Division of Land Resources and Conservation Districts, the SC Association of Conservation Districts and the USDA-Natural Resources Conservation Service.

The **PLANNING AND POLICY SECTION** of the Land Resources and Conservation Districts Division provides a wide variety of land resource information and conservation planning assistance. Section staff collect and analyze information on the existence and use of the State's land-based natural resources and disseminates this information in the form of resource studies, inventories, maps, and direct public assistance. Staff works with the general public, government agencies, private companies, and conservation organizations and other land users to collect, disseminate, and apply resource data to promote wise land management decisions, sustainable development, and effective resource planning efforts in the State.

LAND RESOURCES INFORMATION CENTER (LRIC) - The LRIC, established in 1977, is the state affiliate of the U.S. Geological Survey's (USGS) Earth Science Information Center (ESIC). This Center is a public outlet for resource information and is a vital source of data for planners, resource managers and the general public. The resources of the Center are utilized to promote land conservation and provide information on available map and photo products and their applications. The Center provides products such as topographic maps, nautical charts, aerial photographs, digital data, National Wetlands Inventory (NWI) maps, lake and special purpose maps and other information. In addition, professional staff provides expertise and guidance to individuals in project planning and referrals for other related information. The scope of services and products available through the Center during FY 95-96 included:

- During fiscal year 1995-1996 approximately 6,000 individuals were directly assisted. It is also estimated that 5,000 to 8,000 individuals were also reached through presentations, exhibits and meetings concerning the services of the LRIC.
- Exhibits, presentations, newspaper and magazine articles were utilized during the year to allow for increased awareness of the services of the LRIC and the application of available information for wise land management and resource planning decisions. Exhibits were utilized at a number of events, which included: the Myrtle Beach Wildlife Exposition; the Southeastern Wildlife Exposition; the Palmetto Sportsmen's Classic; Annual Conference of the SC Chapter, American Planning Association; the Lovable Cities Conference; and various National Flood

Insurance Program (NFIP) Conferences and meetings.

- The LRIC provided assistance in the establishment of a regional Land Resource Information Center in Moncks Corner to enable more localized cartographic and planning related customer service.

- Two (2) editions of the Land Resources Information Center Bulletin were distributed to an expanded mailing list during FY 95-96. This bulletin contains current information, products, and services related to cartographic, earth science, and land resources information.

- A color laser copier was obtained for the Center. This color copier has allowed the Center to greatly expand its services by providing high quality color copies of aerial photography for customers on site. A small scale laminating machine has also been obtained by the Center to allow for the lamination of aerial photos and other products of the Center.

- In addition to the existing NAPP statewide aerial transparencies, the LRIC acquired laminated color contact prints for more than 80% of the state. These contact prints offer many useful benefits including color copier reproduction capabilities.

NAPP PROGRAM - The Division coordinates the National Aerial Photography Program (NAPP) for the State. This federal-state USGS sponsored cost-share program, offered every five years, is a cooperative public and private sector effort in South Carolina to acquire a statewide set of high altitude color infrared aerial photography and to offer a wide range of photographic products to the public through the LRIC. This program involves the financial cooperation of 27 public and private organizations. There is a total of 4,700 nine-inch square film images, with each separate exposure capturing 32 square miles of terrain. The rigid specifications of this aerial photography program make it one of the best in the nation, producing high resolution, high quality color infrared film for a wide variety of uses. Program highlights include:

- NAPP products are ordered through the Section's LRIC. The Center provides assistance in image interpretation, project development and ordering. Products include a variety of custom scale corrected enlargements, contact prints, contact films, and mosaics, the NAPP film can also be purchased in a digital format. Products include digital scans, digital mosaics, digital rectified scenes, and geo-referenced files.

- Nine private and public organizations have invested in total statewide NAPP coverage. These include land and water divisions of DNR, Westvaco, SCE&G, SCDHEC, SCDOT, SC Forestry Commission, US Fish and Wildlife Service, and the USDA Natural Resources Conservation Service (NRCS). DNR's Marine Center and OCRM acquired coastal county coverage; and the US Forest Service, SC Regional COGs, Federal Land Bank of South Carolina and DNR Fisheries Division have invested in significant regional NAPP coverage.

SCMAPS PROGRAM - SCMAPS is a three-way venture designed and implemented by the SC Department of Education, SC Department of Natural Resources and Clemson University. The Program is designed around map products with curriculum activities developed for Ecology, Earth Science, Social Studies, History, Math, and Literature. Section staff assist in the coordination and teaching of SCMAPS workshops, serve on the Advisory Board, and coordinate the compiling and distribution of maps and photography products that make up the SCMAPS teaching packages. The Division Coordinated workshops for teachers, including three comprehensive 3-day workshops with the Science and Math HUBS, 90 teachers went through the program.

- SCMAPS has been approved under the State's School Book Adoption Program which makes this curriculum easily accessible through the State's 91 school districts.

PLANNING OUTREACH PROGRAM - During FY 95-96, the Division continued to provide and expand its information, planning services, and technical assistance to local and regional governments, with an emphasis on natural resources protection.

- Planning outreach is effected by a multi-disciplinary team of natural resource professionals who provide information tools and services to support conservation planning by regional councils

of government, local governments, and private enterprises.

- Staff participated as conference hosts, planners, speakers, or exhibitors in a variety of planning-related meetings, such as the Joint Conference of the South Carolina and North Carolina Chapters of the American Planning Association, the National Teleconference on Sustainable Communities, the Lovable Communities Conference, the State Mapping Advisory Committee Biannual Conference, the Upstate Greenways Forum, the Catawba Corridor Connection Initiative, the SC Wildlife Federation's Annual Fish and Wildlife Conference, the SC Forest Stewardship State Coordinating Committee meeting, Clemson's Geological Sciences Advisory Committee, and the SC Department of Transportation's Transportation Enhancement Judging.

- The Division hosted a number of interns, including three exchange students from Germany studying landscape architecture and geographic information systems.

STEWARDSHIP DEVELOPMENT PROGRAM - The Division has developed the Stewardship Development Program to recognize annually those development projects in South Carolina which have done an outstanding job of blending natural resources protection and enhancement into their project design and management. A stewardship development sign and logo will be utilized by those projects chosen for this recognition to advertise their achievements. A Stewardship Development Advisory Board composed of 17 co-sponsoring representatives of public and private organizations provides overall direction to this program and serve as a judging committee for project selections. The Stewardship Development Program provides opportunities for developers to receive DNR suggestions and guidance for the incorporation of natural resource protection within their development planning and management goals. Projects recognized during FY 95-96 included:

Spring Island, Dewees Island, Duke Power's Bad Creek Project, Aiken's Constructed Wetlands Project, and Brays Island.

LAND RESOURCES INFORMATION - The section continued the collection, analysis and distribution of cartographic, earth science and natural resource information to support Division goals and meet requests from the public. Activities included:

- Completed an inventory of DNR-owned lands in the state. Staff reviewed DNR deeds, plats, maps, and visited county courthouses to obtain records for this inventory. Resource technology staff created an Arc/Info GIS with general property boundaries on a 1:100,000 scale base map.

- Updated computer resource databases to meet program and public requests. Databases included: Topographic mapping status, Geographic names, Aerial photography inventory, Environmental contacts directory, and Resource managers and planners mailing lists.

- Researched and contacted key DNR division staff in preparation of a resource planning information packet for local planners, who are preparing the natural resource's element under the Comprehensive Planning Act. The packet contains a description of major natural resource protection issues, a directory of key DNR officials, and a selected list of resource information sources in the state.

SOIL SURVEY PROGRAM - The Land Resources and Conservation Districts Division of DNR is a cooperator with the USDA-Natural Resources Conservation Service (NRCS) and the South Carolina Agricultural Experiment Station in the National Cooperative Soil Survey Program. Soil surveys provide valuable information on the State's soil resources, which is essential for land use planning, economic development, wetlands identification, soil and water conservation, agricultural operations, and a wide variety of other uses. During FY 95-96 accomplishments included:

- Numerous requests for specific soils and land use information by phone, walk-ins, and site visits have been answered by the State Soil Scientist. These inquiries came from local governments, federal agencies, and other state agencies, utility companies, environmental

consultants, private citizens, school children and teachers.

- The section's soil cartographer transferred approximately 500,000 acres of soil survey field sheet data as part of the process of soil survey digitization for newly surveyed counties.

- In a continuing effort to build public awareness as to the value and use of available soils information, educational programs for both adults and youth have been developed and implemented. Educational efforts included writing background information and exercises for the soils portion and the non-point source pollution portion of the SCMAPS program.

RESOURCE TECHNOLOGY AND DIGITAL MAPPING - This program is generally involved with satellite image mapping performed by the Southeastern Remote Sensing Center (SERSC) and digital land resource related geographic information systems (GIS) data uses. These functions produce various land use/cover data sets and special-purpose GIS data bases for use by resource managers, urban and regional planners, conservation organizations and the public. Major accomplishments for FY 95-96 include:

- The SERSC disseminated land cover data to diverse users throughout the year. Program staff also disseminated land resources related digital data and map products to public/private sector users at nominal cost.

- Mapped urban change from 1973 to 1995 in the metro Charleston area using 12 satellite images over 22 years together with local planner knowledge of land uses so that these planners can guide future development within this fragile coastal ecosystem.

- Mapped and field checked land cover in cooperation with NOAA's Coastal Change Analysis Program (CCAP). This work converted land cover data from 17-class statewide data to 14-class CCAP standard, leading to coastal change detection.

- Mapped forest cover types (longleaf/loblolly/slash pine) on Fort Jackson as part of a "Species at Risk" investigation with Wildlife Diversity Section staff.

- Designed and constructed a data base for the Lynches Woods park with the Newberry Conservation District including soils, elevation, trails, park boundary, roads, streams, geologic features and power lines for improved park planning and management.

- Mapped the lower Bush River/Camping Creek watershed in Newberry County as part of an agricultural non-point source pollution project with SCDHEC and USEPA.

- Designed and assembled a GIS in cooperation with the Palmetto Greenways Initiative (Beaufort County Project) as part of a continuing effort to map landscape features of ecocultural tourism interest in the lowcountry of South Carolina.

- Developed proposals for two major partnership oriented, federally funded projects:

- (1) Winyah Bay Coastal Ecosystem Focus Area wetlands mapping and conservation and

- (2) statewide biodiversity gap analysis project (GAP) mapping and habitat protection.

- Staff also performed the following major efforts: potential NPS pollution project sites mapping, Congaree Swamp National Monument database enhancement, Santee Coastal Reserve management area mapping, I-77 Corridor planning mapping with SC/NC Chambers of Commerce and statewide surface hydrology dataset streamlining.

ENVIRONMENTAL REVIEW PROGRAM - The Division's Environmental Review Program provides comments, as part of DNR's interdivisional environmental review process, on state and federal environmental permits. The Division has an Environmental Quality Manager responsible for the environmental review process who also coordinates the input from a multi-disciplinary team of professionals including an engineer, soil scientist and planner. The Division received and provided comments on 202 projects.

NATIONAL FLOOD INSURANCE PROGRAM - The Section's National Flood Insurance Program (NFIP) office serves as a liaison between the Federal Emergency Management Agency (FEMA) and the 190 towns and counties in the state that participate in the program. A staff of three work with the 223 communities identified as having areas of a special flood hazard by the

Federal Emergency Management Agency. During Federal FY 96 funding period, 6 communities were visited to evaluate community enforcement and compliance of flood damage prevention regulations; ordinance assistance was provided to 70 communities; 17 local official workshops were held; and 3 newsletters were published and distributed to 700 local officials, emergency management coordinators, and chief executive officers. More than 1375 requests for information and technical assistance were received and processed. More than 400 people attended training courses coordinated by NFIP staff. Five new communities joined the NFIP during the year. Flood policies in effect rose 15% since February 1994. South Carolina ranks sixth in the nation for the number of flood policies in effect.

STATE NONPOINT SOURCE MANAGEMENT PLAN - Staff reviewed the 1995 revised State of South Carolina Nonpoint Source Management Program and worked with the DNR Environmental Programs Committee to prepare agency comments to submit to DHEC, which is the lead agency for the state nonpoint source program. The program includes responsibilities for DNR and soil and water conservation districts, including designating the Land Resources and Conservation Districts Division as the lead for the agricultural portion of the program.

WATERSHED PROJECTS - Projects were implemented in three watersheds to protect water bodies and groundwater from nonpoint source (NPS) pollution. NPS pollution results from excess sediment, fertilizers, animal wastes and pesticides contained in surface runoff and groundwater leaching. Competitive grant funds from Section 319 of the federal Clean Water Act were used to help implement the projects. The federal funding was provided by the US Environmental Protection Agency through the SC Department of Health and Environmental Control.

The **Camping Creek/Bush River Agricultural Watershed Project** in Newberry County was continued for the second year to provide education, training, technical assistance and demonstrations for farmers on the management of fertilizers, pesticides and land application of animal wastes. Activities include workshops, development of nutrient management plans, development of a computer expert system to assist farmers with the selection of pesticides for use on cropland, development of a local nutrient testing service for poultry litter used as fertilizer to assist farmers in avoiding over fertilization, and demonstrating the proper pumping of animal waste from lagoons and irrigating it onto agricultural land for fertilizer. The project is being implemented in cooperation with Newberry Conservation District, Clemson University, SC Department of Agriculture, USDA-Natural Resources Conservation Service and SC Poultry Federation.

The **Stevens Creek Watershed Project** was started in Edgefield, Greenwood, McCormick and Saluda Counties. The project includes education, training and demonstrations on practices to reduce sediment and other nonpoint source pollution from agriculture, silviculture and unpaved roads. The project is being implemented in conjunction with Edgefield Conservation District and the Ninety-Six District Resource Conservation and Development Commission. Other cooperators include Greenwood, McCormick and Saluda Conservation Districts; Edgefield, Greenwood, McCormick and Saluda Counties; Natural Resources Conservation Service; SC Forestry Commission; and Clemson University.

The **Conneross Creek Watershed Project** was started in Oconee County. The project includes education, training and demonstrations on agricultural practices to reduce nonpoint source pollution from cropland, pastures, dead bird disposal (from poultry operations), and poultry manure management. The project is being implemented in conjunction with Oconee Conservation District, Natural Resources Conservation Service, Clemson University and other agencies and organizations.

LAKE AND WATERSHED ASSOCIATION OF SOUTH CAROLINA - The Division worked with the Lake and Watershed Association of South Carolina (LWASC) to conduct public education on the relationships between land and water management as a component of comprehensive

natural resource planning and management.

URBAN CONSERVATION CENTER - A cooperative project was continued with Clemson University to develop an Urban Conservation Center at the Sandhill Research and Education Center near Columbia. The purpose of the center is to provide education, demonstration and training on urban nonpoint source pollution for the construction industry, the general public, teachers and students. The first phase of the project was completed during the year.

SUSTAINABLE AGRICULTURE - The Division continued an initiative on sustainable agriculture to promote agricultural practices that are environmentally sound, economically feasible, and meet food and fiber needs. The initiative places a sustainable agriculture focus on existing agency programs and it expands the Division's participation with other agencies and organizations. Activities during the year included conducting sustainable agriculture training in conjunction with Clemson University and South Carolina State University for Extension Service and other state and federal natural resource agency personnel, and conducting a sustainable agriculture forum in January 1996 in conjunction with the South Carolina Sustainable Agriculture Network.

AGRICULTURAL WATER QUALITY HANDBOOK - Work was started on the development of a handbook of on-farm methods to prevent nonpoint source pollution from agriculture. The primary purposes of the handbook are to provide practical information to farmers to assist them with understanding, planning and implementing whole-farm resource management plans, and to provide a publication that can be used by agencies and organizations to communicate among themselves and assist farmers. Over 200 farmers and individuals from more than 50 agencies and organizations assisted with the project by providing information, suggestions, and review and comment of material as it was written. The first draft of the handbook was completed, with final development scheduled for late 1996 and printing scheduled for spring 1997.

ANIMAL WASTE MANAGEMENT - Information was provided to the DNR Environmental Program on issues and concerns related to animal production and waste issues. Information and assistance were provided to the DNR Board for the development of a position statement calling for the strict enforcement of reasonable regulations on management of animal waste from livestock production operations. The statement also directed DNR to develop programs to assist regulatory agencies and the industry to manage waste activities and protect against potential environmental effects.

CERTIFIED CROP ADVISERS - At the request of the American Society of Agronomy, a staff member served on the South Carolina Certified Crop Adviser (CCA) Board, and chaired the Board's Standards and Ethics Committee. The SC CCA Board is part of the National CCA Program administered by the American Society of Agronomy. The CCA Program is a voluntary program under which private sector and agency individuals who advise farmers on crop production can be certified based on their competency in soil and water management, soil fertility, pest management and crop production.

LANDSCAPE ARCHITECTS - The Department is responsible for the registration of Landscape Architects under the authority of the Landscape Architects Registration Act, Chapter 40-28-10 of the SC Code of Laws of 1976, as amended, and is advised and assisted by the Landscape Architect Advisory Council. The purpose of the Act is to protect the health, safety and welfare of the public through the registration of qualified professionals. Staff provided for annual registration renewals, investigated complaints and assisted the Landscape Architect Advisory Council. A directory of registered landscape architects and a brochure on the program are available to assist the public in understanding the role and the qualifications of the professional landscape architect in South Carolina. Currently, 415 Landscape Architects are registered, and 65 firms hold Certificates of Authorization in South Carolina.

LANDSCAPE ARCHITECTS REGISTRATION EXAM (LARE) - The Department is a member of the national Council of Landscape Architectural Registration Boards (CLARB) and administers

the national registration exam. CLARB prepares and evaluates the national registration exam for landscape architects. The entire exam is offered in June of each year and the performance sections are offered again in December. This national registration exam is administered by 45 states, British Columbia and Ontario. These boards regulate the profession of landscape architecture. The Department proctored 16 candidates who sat for 76 individual sections during the three-day session of the June exam. During the two-day December session, 16 candidates sat for 30 individual sections of the exam.

LANDSCAPE ARCHITECT ADVISORY COUNCIL - The Department appoints a five (5) member Landscape Architect Advisory Council composed of professional landscape architects with a minimum of five (5) years experience to assist the Department.

Steve McCalla	Columbia
Jean Rothrock	Pawley's Island
Perry Wood	Hilton Head
Lolly Tai	Easley
Scott Sonnenberg	Easley

SOIL CLASSIFIERS - The Department is responsible for the registration of Professional Soil Classifiers under the authority of the Soil Classifiers Act of 1974, as amended. Currently, 25 professionals are registered in South Carolina. The purpose of the Act, through examination and licensing, is to ensure competence and professionalism in the field of soil classification. Staff conducted the annual registration renewals, assisted the Soil Classifiers Advisory Council, and served as a liaison with other agencies.

SOIL CLASSIFIERS ADVISORY COUNCIL - The Soil Classifiers Advisory Council membership is composed of five (5) registered soil classifiers who are appointed by the Department.

Dennis DeFrancesco	Camden
Richard Scharf	Columbia
John Thorp	Summerville
Bill Smith	Clemson
Ben Stuckey	Columbia

LAW ENFORCEMENT

Law Enforcement Advisory Committee

Thomas W. Miller, Chairman	Anderson
John Jernigan, Vice Chairman	Columbia
William Terry LeCroy, Sr.	Bradley
Yancey A. McLeod, Jr.	Eastover
Knox L. Haynsworth, Jr.	Greenville
David M. Cline	Greenville
David B. Burnside	Hopkins
Coy Johnston	Summerville
Jackie D. Black	Columbia
W. Jeffery Price	Columbia

Fiscal Year 1995-96 was an important year for the DNR Law Enforcement Division. The organizational structure was revised into three branches. The largest, the Field Operations branch is headed by a Lieutenant Colonel who is responsible for all inland patrol districts as well as the investigations, records and intelligence functions. A Major heads the Marine and Education Affairs branch with responsibility for the marine patrol district, aquatic programs, and hunting and boating education programs. Also headed by a Major is the Staff Operations branch wherein lies responsibility for central administrative functions including business, communications, unusual occurrences coordination, training, aviation and forfeiture sales. All staff officers regularly spend a portion of their work week in enforcement operations.

The field districts experienced a productive year with effective enforcement efforts throughout the state. Each district had different and remarkable cases ranging from illegal possession of coyotes to the illegal taking of a sturgeon, the only case of its kind in the nation. Changes in the enforcement of dove hunting regulations were efficiently implemented with an improved dove season and fewer criminal cases.

Nineteen ninety-six saw the enactment of expanded summons authority for DNR officers. A fact that enhances our ability to deal efficiently with various crimes encountered on the waterways and agency managed land. Also, passed in 1996 was legislation to improve safety in boating activities. This law will become effective in the spring of 1997.

Individual program initiatives included a strengthened boating saturation patrol called the *Boating Safety Action Force* or B-SAF Team. This specialized unit travels all state waterways focusing enforcement on safety violations and boating under the influence (BUI). A canine program has been implemented on a pilot basis with the dog trained to detect deer and duck, and to track violators and lost persons. In the upstate, a mounted patrol is also being evaluated as a possible permanent addition. This effort has been made possible through the cooperation of the equestrian program at Clemson University.

Throughout the year gains were made in the equipment and training furnished to officers. Future years will see a continuation of effort and emphasis in this area to ensure that officers are sufficiently well equipped and trained. Significantly, the Deputy Law Enforcement Officer (DLEO) program follows this trend after extensive revisions were implemented in 1996, including changing requirements, use and authority of DLEOs.

Nineteen ninety-six saw considerable effort in strengthening the Law Enforcement Division's accountability. Maintaining high ethical standards has been a high priority in 1996 and will continue in all future years.

Overall, the administrative emphasis of the Law Enforcement Division has been to provide effective and efficient conservation/resource law enforcement services. Flexibility in operations, careful selection and training of officers and attention to quality standards have been the focal

points for this year. The Law Enforcement Division is committed to its responsibilities and sees the future as an opportunity to grow and evolve with changes in demand for services.

FIELD OPERATIONS

Department of Natural Resources officers successfully prosecuted four thousand six hundred eighty-two (4,682) cases, and an additional five thousand three-hundred fifty-five (5355) warning citations were issued. A general breakdown of cases for the fiscal year is as follows:

GAME AND FISH	2998	BOATING	2694
SALTWATER FISHERIES	1038	WMA VIOLATIONS	717
MIGRATORY BIRDS	624	TURKEY	103
OTHER	1329	WARNINGS	5355

In addition to issuing summonses, our officers were also involved in the following: expended 3084 hours assisting other law enforcement agencies; answered eight hundred ninety one (891) nuisance animal complaints; presented four hundred eighty (480) public programs; issued seven hundred thirteen (713) deer depredation permits; coordinated and conducted twenty successful "Get Hooked on Fishing Not on Drugs" fishing rodeos (attendance ranged from one to two thousand children under the age of sixteen). We also worked closely with other divisions within the DNR to ensure we are educating the public appropriately and that we are properly managing our natural resources in the state. Officers wrote summonses for the period totaling \$803,679.23 in fines.

Investigations: Our investigation section has been restructured. It is now a combination of the covert operations unit and marine theft unit. This combined unit has nine members and is responsible for the investigation of all types of criminal activity. Additionally, this section also inspects aquaculture and permitted businesses selling alligator products. Our case activities include the examination of approximately three hundred fifty (350) boats, which resulted in approximately thirty cases. Our resource cases include three federal Lacey Act cases on deer, eight cases for the sale of wild turkey, two cases for the possession of coyotes, and four night hunting for deer cases.

MARINE LAW ENFORCEMENT/EDUCATION AFFAIRS

South Carolina is ranked 8th in the country in the number of registered motorboats with 397,000. This number continues to grow each year as more people take to the water for fishing, hunting and recreation. The job responsibilities of this section consist of boating and hunting accident investigations, aids to navigation, waterway hazard removal, diving for search and recovery purposes, marine event applications, zoning and regulatory waterway investigations, and boating saturations patrols with the Boating Safety Action Force (B-SAF).

Boating Accident Investigations: This area is responsible for processing all boating accident reports, providing investigative assistance for accidents that involve fatalities or serious injuries, and forwarding the information gathered to the United States Coast Guard. Last year there were one hundred and forty boating accident reports reviewed and processed. Included in those reports were eighteen fatalities. A study of accident reports show that seventy-five percent (75%) of all persons involved in fatal boating accidents have had no formal boating safety training. Therefore, resources will be used to reach those boaters in the field and classroom in an attempt to provide a safer boating environment.

Aids to Navigation: A total of one thousand two-hundred fifty (1,250) aids to navigation and regulatory markers are maintained by this section. These buoys mark hazardous sites and regulated areas on the waters of the state and must be inspected on a regular basis. It is the objective of this section to expand the maintenance and inspection program to keep pace with the growth in boating. During 1996 more than four hundred fifty (450) aids to navigation and

regulatory markers were replaced, and one hundred twenty nine (129) information signs were distributed. Moreover, routine inspections and verification of positions must be conducted every month.

Zoning Investigations: Zoning investigations are conducted as a result of an official request from a member of the public, or one of our enforcement officers believes an area needs to be zoned "SLOW TO NO WAKE". Section personnel investigate each complaint thoroughly, and zoning is recommended only if other means will not correct the situation. The utilization of information signs pertaining to wake responsibility in certain areas instead of official regulation has been very successful. There were eighty-eight (88) investigations this year. These requests seem to increase from year to year and take up a large portion of the work time.

Hazard Removal: Another area of responsibility is the removal of boating hazards. In this area divers use a specialized underwater chain saw to remove boating hazards such as stumps and logs. With the removal of these hazards it is no longer necessary to mark these sites with buoys. This saves time and monies that would have been spent in the maintenance of hazard markers.

Divers (Search and Recovery): The department's law enforcement dive team is comprised of officers from various law enforcement districts. These positions on the dive team are voluntary and involve hundreds of hazardous work hours for these officers each year. The dive team is responsible for searching for drowned persons as well as assisting SLED and other law enforcement agencies in the searching for evidence of a crime that may have been thrown into the water. Last year the dive team participated in forty-nine (49) dive assignments.

Marine Events: Authorization to hold approximately five hundred (500) marine events were issued by staff during the year. These events include regattas, boat races, fishing tournaments, parades, etc. Permits are necessary so that multiple events will not be held in the same area, for safety reasons. Staff is responsible for reviewing and authorizing these events.

Boating Saturations (B-SAF): The division's boating safety action force consists of thirteen (13) highly trained boating officers. During 1996 this team was responsible for eight (8) special patrols that resulted in one thousand one-hundred twenty-five (1,125) cases (three hundred eighty-four (384) summons and seven hundred forty-one (741) warnings) and \$28,792.00 in fines. Special emphasis was placed on BUI (Boating Under the Influence), and negligent operation. These patrols were conducted in high complaint areas. Emphasis was placed on high profile enforcement as well as education through handing out boating safety literature.

Education: This area consists of the Hunter Education and Boater Education programs. These programs are conducted statewide by ten full time law enforcement officers in conjunction with a very helpful volunteer force. For FY 1995-1996 the education element accomplished the following:

- The Hunter Education program conducted two hundred sixty three (263) ten hour courses and certified approximately ten thousand (10,000) students. More than one hundred (100) public and private schools offered the program during this time.
- The Boater Education program certified five thousand five hundred (5,500) students in the eight hour boating course, and four thousand (4,000) students were enrolled in the boating home study course. Eighty-six (86) public and private schools offered this program.

STAFF OPERATIONS

Plans, Inspections & Unusual Occurrences: This section is responsible for overseeing the department's involvement in the State Emergency Preparedness Plan. Due to severe inclement weather conditions this year, the state activated the Emergency Operations Center four times. There was a total of thirteen (13) hurricanes and one major ice storm that impacted the state during the year. In each of these situations the Department was required to monitor the situation

and be prepared to activate and deploy DNR officers if needed. In addition to responding to weather related emergencies, the Department assisted other state & federal agencies in escorting one train carrying foreign spent nuclear fuel from Charleston to the Savannah River Plant.

The Emergency Preparedness Coordinator participated in the State Hurricane & Earthquake Conference and attended numerous other emergency preparedness planning sessions. In addition, he participated in and helped coordinate eight (8) public events including the Palmetto Sportsmen Classic and State Fair.

The Emergency Preparedness Coordinator worked with a committee to develop a Department Emergency Preparedness Plan. This plan was recently finalized and has been used on two occasions to direct department activities in an emergency situation. In addition, to assist the department's efforts in emergency preparedness, a Department Emergency Operations Center has been created and was activated on two occasions.

Commissions and Legislation: This section is responsible for monitoring legislative efforts of the division, and maintains all law enforcement commissions and administrative records. The Legislative Coordinator tracks all legislation that affects the division, and assists the department in legislative matters. The Legislation Coordinator or designee attended all committee and subcommittee meetings of the General Assembly that addressed legislative matters pertaining to law enforcement activities. The Legislative Coordinator was responsible for developing and issuing a law manual that was specifically designed to be used by DNR Law Enforcement Officers. The Legislative Coordinator also participated in the development of a departmental strategic plan and the recodification of Title 50 laws dealing with game protection and marine resources.

In addition to these functions, this section also oversees the sale of forfeiture equipment. Sales of forfeited equipment resulted in approximately twenty-nine thousand (\$29,000) dollars to the Department.

Deputy Law Enforcement Officer Program: In an effort to better serve the public and protect the natural resources of the State, the Law Enforcement Division utilizes non-compensated commissioned personnel to augment full-time DNR law enforcement officers. The General Assembly of the State of South Carolina amended section 50-3-315 of the Code of Laws of South Carolina relating to Deputy Law Enforcement Officers (DLEO), so as to revise their authority, powers and requirements, and to require the department to establish a training program. Amendments which became effective July 1, 1996, that impacts this programs are:

- Make a distinction between DLEOs that are employed by the department, and those who are not;
- DLEOs have statewide police powers;
- The department will administer the DLEO program through the Natural Resources Enforcement Division;
- Established the following education requirements: non-departmental DLEOs must complete the basic state constable's course at their own expense, department employed DLEOs must be certified by the S. C. Criminal Justice Academy, DNR establishes training for DLEOs commissioned before July 1, 1980, and all DLEOs must successfully complete required refresher training;
- Establish a strength plan (per district).

The Department Policy (policy #300.01) that affects the operations of the DLEO program was revised and became effective August 16, 1996. Some of these changes include:

- Establishing selection and conduct guidelines;
- Establishing equipment authority, (i.e., responsibility and utilization, uniforms and updated patch;
- Established operations guidelines to include a quarterly activity report.

By November of 1996, all DLEOs that have successfully met the education requirements will

have had the opportunity to review and discuss the changes that were made by statute or policy, and will have received their new badges and credentials.

Training: This section is responsible for coordinating and conducting all law enforcement related training. In addition, this section maintains training records for all DNR officers, and other department commissioned personnel. The following training activities/programs were conducted over the past fiscal year.

- More than two hundred new applicants were tested for four DNR law enforcement positions;
- In-service training for 250 law enforcement officers was conducted; (In-service consisted of firearms recertification, All-terrain Vehicle training, first aid and CPR training, a class on BUI detection and drug eradication taught by officers from the Georgia Department of Natural Resources).
- A five (5) week Basic Wildlife School was conducted for the four new DNR law enforcement officers;
- DNR law enforcement officers conducted a basic boating school at the Criminal Justice Academy for other law enforcement agencies (fourteen "14" officers attended training);
- A basic detective school was conducted by department legal staff for DNR officers (Nineteen "19" law enforcement officers attended this class);
- In-Service training for non-law enforcement personnel was conducted (Eighty-six "86" personnel attended, and training consisted legal updates and weapons re-qualification);
- In-service training was conducted for Dive Team personnel;.
- A special two week basic training course intended for Deputy Law Enforcement Officers was conducted (Twenty "20" department personnel attended training);

In addition to these training activities, the Law Enforcement Division recently implemented two new enforcement programs. The Equestrian Enforcement Unit (nine officers) and the K-9 team (one officer/dog) was formed as pilot programs to address special law enforcement needs. Training for the Equestrian Unit was conducted at Clemson University. The training for the K-9 unit was conducted in Florida by the Florida Game and Fish Commission.

Aviation: The basic mission of this section is to provide aviation support 24 hours a day, seven (7) days a week to the Department of Natural Resources and to other State, Federal, County and municipalities as requested. The section consist of three (3) full time pilots and one (1) part-time pilot. Aircraft within the section consist of: One (1) McDonnell Douglas Helicopter with INFRARED capability; One (1) twin-engine (Aero Commander); three (3) single engine aircraft (two (2) Cessna's and one (1) Champion Citabria. The mission responsibilities of the DNR Aviation Section are diversified and specialized. The primary missions include: Search and Rescue, DNR inland law enforcement, DNR marine law enforcement, manhunts, aerial surveys and photography, and support other flight operations as needed.

Aircraft Type	Number of Flights	Hours
Helicopter	75.0	204.3
Cessna 180	87.0	309.6
Cessna 206	76.0	244.5
Aero Commander	103.0	329.1
Citabria	85.0	175.4
TOTAL	426.0	1,262.9

DIVISION OF MARINE RESOURCES

Marine Resources Advisory Committee

Mary Pope M. H. Waring, Chairman	Charleston
William L. Hiott, Vice Chairman	Charleston
James Smiley	Isle of Palms
Charles W. Stone	Murrells Inlet
Edward C. Lee	Columbia
Porter B. Rose	Greenville
Marion W. Sams, Jr.	Edisto Island
Willie C. Shelley, Jr.	Murrells Inlet
Frances F. Limehouse	Charleston
Mitchell Sidney Scott	Allendale

Marine Recreational Fisheries Advisory Committee

Mary Pope M. H. Waring (DNR Board)	Charleston
Russell P. Patterson, Chairman	Hilton Head
William E. Whitley, Vice Chairman	Hanahan
Stuart Ballard	Georgetown
Willie C. Shelley, Jr.	Murrells Inlet
Peter Dodds	Mt. Pleasant
Stephen L. Chryst	Myrtle Beach
Marion R. "Spike" Simmons	Walterboro
Dale Cooler	Ridgeland

The Division of Marine Resources is responsible for the conservation, protection and wise use of the state's marine resources through efforts in research, management and public education. The Division addresses coastal issues by conducting projects to analyze conditions in the commercial and recreational fisheries and the habitats upon which these fisheries depend. The Division explores new and promising fishing technologies for new and expanded fisheries and other developments in seafood production and actively investigates environmental and ecological concerns. The Division also provides ongoing research to fulfill the goal of fostering a seafood farming industry throughout the state's coastal area through programs at the James M. Waddell Mariculture Research and Development Center and serves as the state's mission-oriented research facility in the area of marine resources in general.

COASTAL INFORMATION EDUCATION & COMMUNICATIONS OFFICE

This office provides broad based informational, educational and public affairs support to all agency coastal programs and activities, including those of the Division of Marine Resources, Division of Conservation Education and Communications and the Division of Law Enforcement and Boating. Support includes production of news releases, coordination of media relations, the production of special publications, writing SCW magazine articles, dispensing public information, conducting Center based tours and educational cruises, performing educational outreach activities, implementing the Speaker's Bureau, development of interpretive literature and facilities, field editing of the agency's semiannual newspaper, conducting special agency functions and other appropriate activities. It is also the mission of the Coastal Information



Education and Communications Office to inform and educate the citizens of South Carolina about:

- the tremendous ecological diversity and economical value of South Carolina's natural coastal resources
- what the Agency is doing to better understand, manage and conserve these resources
- the expertise we use in our management and research endeavors and
- what user groups can do to protect and conserve these resources.

This office processed more than 70 press releases during the reporting period, covering Marine Resources Division activities and the District 9 Coastal Law Enforcement.

Coverage included periodic stories such as announcing various fishery season openings, public meetings, seminars, regulations and other routine topics. In addition to routine stories, an ongoing effort was made to report project activities of the Marine Division and the District 9 Coastal Law Enforcement at every opportunity. The news desk routinely assisted with promotion of the Governor's Cup Bill Fishing Series, Harry Hampton Banquet, the Marine Division's Bi - Annual Fishing Fair and other events and programs that require public notice and promote participation.

In this reporting period a new press release initiative was continued. A series of news features was written and disseminated to coastal newspapers. Photos and graphics were provided for each news feature package. Features go into more depth and detail than a regular story and they are very useful for providing information to the public on more complex issues. Features completed to date included stories on the artificial reef program, shrimp mariculture, shrimp baiting, Governor' Cup Bill Fishing Series and the like. All releases in the series met with great success with coastal newspapers. Our goal for 1996 -1997 is to develop one feature per month and average one regular release per week.

The information desk received hundreds of telephone calls from the public requesting information on a wide range of topics, including hunting and fishing information, regulations, conservation inquires, referrals for wildlife assistance and educational activities to name a few. The desk also serves as backup for the central switchboard for handling and routing calls when an immediate referral is not known to the switchboard operator.

In an effort to improve communications throughout the Division, the Coastal Information Education and Communications Office continued to produce a monthly in-house newsletter entitled "Marine Update" which highlights ongoing program activities, progress reports, new projects, new legislation, priority issues, important meetings, budget concerns, etc. This approach to "improved communications" has been extremely popular with staff at all levels throughout the Division.

During the year, office staff continued to coordinate the Marine Division Speakers Bureau involving programs and presentations across the state. Our greatest efforts were concentrated in the coastal area especially in response to various conservation organizations, fishing clubs, environmental groups, schools, colleges and universities. This effort has proven to be very effective in promoting the overall goals of the Division, encouraging conservation through diverse audiences and highlighting resource related issues and problems.

Special Publications: A number of very popular special publications for public distribution was produced during the year. These included:

- Life in the Saltmarsh Poster
- Clean Vessel Act Brochure
- Clean Vessel Act Poster
- Coastal Facilities Atlas

W. J. N. S. G.

- 1996 S.C. Saltwater Sportfishing Tournaments Brochure
- S.C. Governor's Cup Bill Fishing Series Brochure
- ACE Basin NERR Brochure
- Sea Science Information Series
 - Blue Crabs
 - Shrimp in South Carolina
 - Inshore Summer Fishing
 - Offshore Summer Fishing

Marine Education: During the past year approximately 16,000 students, teachers, coastal managers and scientists participated in the Division's Marine Education Program's educational tours, cruises, classroom programs and special events. Participants came from throughout the state as well as from other states and countries. Approximately 120 educational cruises were conducted providing a hands-on experience to students and teachers which in many cases is their first experience with the marine environment. Topics such as marine conservation, wetlands, non-point source pollution and the role of the Division in research and management of the states marine ecosystems were discussed. Outreach programs to area schools and teacher groups included touch tank classes, shell talks and classes dealing with set-up and maintenance of saltwater aquaria.

The Marine Education Program was also responsible for coordinating large outreach programs including the Myrtle Beach Wildlife Expo, Southeastern Wildlife Expo, Grand Strand Wildlife Day, Palmetto Sportsman's Classic, the Charleston Marine Conservation Banquet, Kid's Fair, Coastweeks and the very successful Marine Fishing Fair.

New equipment was purchased for the MRRI classroom from funds provided by US Fish and Wildlife Service, Harry Hampton and MRFAB to further enhance programs on site. New, updated displays continue to be added throughout the Institute.

Funds from US Fish and Wildlife Service allowed the program to sponsor a series of three educational workshops for Ecotourism operators. Working with the South Carolina Nature Based Tourism Association as well as a number of outside agencies, the Marine Education Program provided the attending tour operators an opportunity to meet with division personnel and gain a better understanding of the marine environment and the activities of the Marine Division that protect this environment. Funding was also used to conduct a second, expanded "Students Teaching Students" program. Students from throughout the state were selected and given a one week course in coastal wetlands throughout the coastal zone. Cooperating agencies included, the North Inlet Winyah Bay NERR, Charleston County PRC, and USC- Beaufort.

The ACE Basin NERR continued education efforts by sponsoring outreach programs and workshops centered in Colleton County. Approximately 1000 persons participated in programs held on site in the NERR with another 5000 reached through outreach efforts. A new program featuring activities for families was started in cooperation with the Edisto Beach State Park and took place on selected weekends throughout the summer. Response to this program was outstanding and plans are being made to expand this program in the upcoming year.

COASTAL RESERVES AND OUTREACH PROGRAM

The Coastal Reserves and Outreach Program is responsible for coordinating and conducting division-level programs involving input from research and management units, providing field support in the outlying regions and managing representative coastal habitats through linked programs of stewardship, public education and scientific understanding.

Marine biologists in Charleston, Beaufort and Georgetown continued to provide information and assistance to marine resource user-groups. Assessment of marine resources needs, problems

and issues were made in liaison with law enforcement and MRD staff in each of the regions. During this FY, staff provided information to enable fishermen to legally and successfully participate in commercial and recreational fisheries. The regional biologists responded to inquiries concerning laws and regulations, access points, resources availability, harvesting techniques, and gear technology. Special efforts were made in liaison with law enforcement. Field support for other division projects and state/federal cooperative research was also provided.

The program continued to implement coastal management plans, acquire key coastal lands and wetlands, and provide on-site management for these properties. Activities continued on Capers Island, a SC Heritage Trust property and a component of the International Man and the Biosphere Program. During this FY, 1,899 persons camped overnight on Capers Island. The average length of stay was 3.9 days. An estimated 3,798 students, teachers, and the general public visited the island for nature study and recreation during daytime hours. Maintenance continued on roads and trails, docks, impoundment dikes, and headquarters facilities. The Victoria Bluff Natural Area continues to serve as a buffer to intensive development pressures in the surrounding areas of Hilton Head and Bluffton. The natural values of this property are becoming more obvious with time. During this FY, public use areas and access points were further defined with signs.

The ACE Basin National Estuarine Research Reserve continued in its fourth full year of funding through NOAA under the 1972 CZMA, as amended. This program is part of a national network of state owned and managed coastal protected areas to promote informed management of the nation's estuarine and coastal habitats. The Bennett's Point Field Station continued to serve as the primary platform for staging research and education activities in the reserve. The reserve has become an effective catalyst for local, regional, state, and federal partnerships and programs to address coastal management issues.

Final evaluation findings, issued by NOAA in November, 1995, noted accomplishments in the areas of staffing, land acquisition, management plan implementation, research and education programs and overall State commitment to the NERRS.

PERSONNEL

This office is a satellite of the Columbia Personnel Office. The primary responsibility of this office is to insure the correct implementation of policies and procedures of the Department at the Division level and other Department components as needed.

This office has the responsibility of assisting Division staff with all personnel matters which include new employee orientation, benefits, disciplinary actions, counseling, referrals, travel arrangements, processing personnel changes, hiring, terminations, recruitment, training and promoting affirmative action.

VESSEL OPERATIONS

Four ocean-going research vessels support research and management investigations of the Division. The R/V Palmetto is a 110' vessel that supports offshore projects. The R/V Lady Lisa is a 70' St. Augustine trawler that works in bays and sounds and near offshore areas. The R/V Carolina Pride and R/V Anita supports inshore projects.

All vessels have trawl capabilities and are able to support extended cruises. Each vessel is manned by U.S. Coast Guard licensed captains. Division vessels support various federal and state agencies with vessel needs as well as academic institutions in their education efforts.

OFFICE OF MANAGEMENT SERVICES FISHERIES LICENSES SECTION

Table 1. Fisheries Licenses issued during FY 1995 and 1996.

	<u>FY 1995</u>	<u>FY 1996</u>
Trawler, Res	544	540
Trawler, Non-Res	275	253
Boats to 18'	904	944
Boats over 18'	211	230
Wholesale Dealers	277	293
Land & Sell	641	665
Bait Dealers	100	105
Crab Pots	387	429
Miscellaneous Pots	8	8
Channel Nets	60	60
Shad Nets	717	823
Gill Nets	567	538
Miscellaneous Nets	6	7
Seine Nets	53	56
Shellfish Dredge	24	12
Shellfish Tongs	68	61
Shellfish Forks	42	36
Shellfish Rakes	220	212
Shellfish	292	292
Gigging	1921	1688
Trawler Captain, Res	619	632
Trawler Captain, Non-Res	294	270
Peeler Crab	23	27
Other	255	469

Table 2. Revenue collected by the License Office During FY 1995 and FY 1996.

	<u>FY 1995</u>	<u>FY 1996</u>
Licenses	\$266,380.46	\$262,849.91
Fines	26,139.05	31,038.78
Rent	24,059.33	25,814.80
Sale of Goods	21,919.45	12,113.15
Total	\$338,498.29	\$331,816.64
Shrimp Baiting	\$341,926.00	\$353,599.00

OFFICE OF FISHERIES MANAGEMENT

The Office of Fisheries Management (OFM) is responsible for proper management of the state's living marine resources and their associated habitats while considering the economic and social benefits which these resources provide and the equitable utilization of fishery resources. This responsibility includes the regulation of fishing seasons, areas and methods, issuance of experimental, scientific and commercial fishing permits, management of public shellfish grounds and maintaining statistical records of various fisheries. The OFM is also quite active in conducting resource assessments and surveys in a broad spectrum of environmental activities related to the protection and enhancement of coastal fisheries habitat.

The OFM works closely with other units within the Division, the Coastal Environmental Enforcement District and various state and federal agencies. The Director of this office serves as the designated state official to the South Atlantic Fishery Management Council and as a Commissioner to the Atlantic States Marine Fisheries Commission. The OFM also maintains close contact with the South Carolina Legislature in making recommendations relating to fisheries laws and regulations. Various informational and advisory services related to commercial and recreational fisheries are provided to the public, including seafood market development and promotion.

The following is a summary of the activities and projects of the OFM during FY 1995/96.

OFM ADMINISTRATIVE OFFICE

Recreational Fisheries Conservation and Management Act of 1991

This piece of legislation was passed and signed by the Governor on May 27, 1991 and became effective on July 1, 1992. Section 50-20-90 gives the S.C. Department of Natural Resources the authority to create and design a stamp and permit and to develop marine recreational fisheries prints and related articles. The sixth S.C. Marine Recreational Fisheries Stamp Art Contest was held on July 29, 1995. The contest received entries from 24 artists. The Marine Recreational Fisheries Advisory Board met several times this year to help prioritize expenditures of the monies generated by stamp and print sales. During 1995/96 approximately 90,388 saltwater stamps were sold to saltwater fishermen, generating over \$480,000. With the help of the Advisory Board, these monies were dispersed to a number of different recreational fisheries development, management and research projects and will help support coastal law enforcement efforts. The annual Marine Recreational Fisheries Stamp Program Report was prepared and distributed.

Legislative Assistance: During the year, OFM staff assisted legislative committees and members of the General Assembly with the development of legislation important to coastal fisheries. Proposed legislation that was prepared, reviewed, and discussed in public forum and passed into law included: a proposal pertaining to the use of bycatch reduction devices in shrimp trawls, new requirements pertaining to the taking of eels, designation of areas for gathering oysters and clams, new requirements pertaining to the taking of eels and providing requirements for importation of shellfish. New issues that were addressed during this period dealt with revision of the blue crab fishery laws, revision of Chapter 17 and restrictions pertaining to taking of overwintering shrimp during winter by cast net.

Permit Administration: It is the function of the Fisheries Permitting and Special Projects Section within the Office of Fisheries Management to administer the Department's statutory and regulatory authority to permit effort to harvest marine resources. Falling into four general categories of harvest allowance, private management, importation, and experimental, a total of 7415 permits were issued during 1995-96

FISHERIES STATISTICS SECTION

The Fisheries Statistics Section (FSS) consists of recreational and commercial data collection groups supervised by a Section Leader. During this performance period, a new FSS Section

Leader and a single Assistant Section Leader were named. The recreational component consists of a Field Chief and two creel clerks (temporary grant), all funded by the Sport Fish Restoration Act (Wallop-Breaux) program. The commercial section was supervised by the Assistant Section Leader (state supported) and included two Port Agents funded by the Cooperative Statistics Program (CSP) with the National Marine Fisheries Service (NMFS). The Section Leader's position was funded by a combination of the CSP (10 mo.) and state appropriations (2 mo.). In addition, an Administrative Assistant (temporary grant) was funded under the Wallop-Breaux program.

During the performance period, the MRD ceased participation in the NMFS's Marine Recreational Fisheries Statistics Survey (MRFSS). A contract between the federal contractor and the MRD to collect MRFSS data was not renewed and one recreational Creel Clerk (temporary grant) was terminated. In addition, one individual resigned from the Section's commercial component (temporary grant, funded under the CSP) and job duties were absorbed by other Section personnel.

The commercial section obtained commercial fisheries catch and effort data via a mandatory monthly report submitted by 231 wholesale and shellfish dealers, voluntary weekly shrimp tickets collected from 19 major dealers, voluntary fish trip tickets submitted by 11 dealers, and landings reports required from participants in several special permitted fisheries (channel net, whelk and horseshoe crab trawl, and shellfish escalator, among others). Shrimp size and species distributions were obtained via routine visits to shrimp dealers during the trawl season. During the performance period, 137 offshore finfish trips were sampled for length frequency distribution, accounting for 11,887 measurements of priority species. Employment and market information was obtained from wholesale dealers via an annual survey.

Recreational catch and effort data were collected from 1 July 1995 - 30 April 1996 as a part of the MRFSS and a state finfish survey (SFS). During the 1995-96 performance period, 1,700 MRFSS interviews and 929 SFS interviews were obtained. Trip reports were submitted by 17 headboats and 227 charter vessels. The annual shrimp baiting survey was completed during the period, with a return rate of approximately 45% (1,528 of 3,479).

MRFSS data sheets were edited in-house and submitted in a timely manner to the NMFS subcontractor. All interview quotas were met during the performance period. SFS data were edited and key entered in-house and updated to in-house databases. Charter vessel trip reports were coded, key entered, edited, and archived. Monthly summaries were generated.

Commercial fisheries data were key entered, edited, and transmitted to the NMFS regional files. South Carolina was the only state in the Southeast to meet all monthly and yearly batch submission deadlines ahead of schedule. Report submission from obligated providers was monitored. When necessary, delinquent letters were mailed to providers and affidavits were generated and forwarded to SCDNR District Nine Law Enforcement for appropriate action. FSS staff supported DNR Law Enforcement officers in court on numerous cases.

Approximately 150 data requests for both commercial and recreational fisheries data were received and processed. Requests were answered from a variety of sources, including DNR staff, the media, academia, other governmental agencies, and private citizens.

Constituent liaison was maintained and enhanced in several ways. Creel clerks distributed printed material such as complimentary fish rulers and fisheries regulations to sportsfishing clubs and tackle shops. Port Agents performed similarly, serving as pipelines for exchange of information between the MRD and the commercial fishing sector. Both recreational and commercial entities were apprised of information from the NMFS, the South Atlantic Fisheries Management Council, and the Atlantic States Marine Fisheries Commission (ASMFC).

FSS staff served as educational cruise biologists aboard Division research vessels. Staff also served the Division as members of numerous in-house coordination committees. The FSS Section Leader served as South Carolina's representative to and Chairman of the ASMFC's

South Atlantic Statistics Committee and as Vice-Chairman of the Southeast Cooperative Statistics Committee. The Section Leader also was named as the South Carolina representative to the Southeast's Recreational Fisheries Information Network program (RecFIN(SE)). The FSS recreational component's Field Chief represented the MRD at regional MRFSS wave review meetings.

CRUSTACEAN MANAGEMENT SECTION

The Crustacean Management Program (CMP) is primarily responsible for the management of the shrimp and blue crab fisheries of South Carolina. This management includes monitoring and assessment of stocks including participation in applied research projects. Staff also make numerous educational presentations and provide general information to the public.

Postlarval Shrimp Survey: During winter and spring 1996, postlarval brown shrimp were found in samples ranging from average to above average quantities beginning in February. Cold weather in early March may have caused a die-off of small brown shrimp in area creeks. Plankton sled collections at several locations indicated greatly reduced numbers following the cold weather. Subsequent recruitment of brown shrimp postlarvae appeared adequate to produce an average brown shrimp crop, as water temperatures in creeks reached average by mid-April. Later sampling indicated that the majority of white shrimp postlarvae recruited in June of 1996 was much less than the numbers seen in 1995.

Juvenile Shrimp and Blue Crab Sampling: Sampling in July-September of 1995 indicated large numbers of juvenile white shrimp in the tidal creeks near Charleston. Creek sampling for juvenile brown shrimp in May and June 1996 produced average numbers of juvenile brown shrimp, at normal sizes for that time of year. In addition, fair numbers of "early" white shrimp, were again observed in June. These shrimp, which precede the peak of white shrimp recruitment by several weeks, have been common in samples during the last several years. Catch rates of blue crab appeared to be above average in number.

Shrimp and Blue Crab Sampling: Commercial Shrimp Season: The commercial trawling season closed on January 5, 1996. The fall 1995 white shrimp season was notable as being the largest harvest on record, estimated at over 6.5 million lb. (recreational and commercial combined). In late April and early May of 1996, ovarian condition and sex ratios of white shrimp were monitored by trawling in Charleston Harbor and off Morris Island on the R/V Carolina Pride and by accompanying commercial trawlers for sampling in nearshore areas off McClellanville, Charleston, Edisto, and Beaufort. Catches of white roe shrimp were above average near Charleston, but below average in other areas, similar to what was seen in CMP spring sampling. Cold weather in January and February of 1996 caused significant mortality of overwintering white shrimp. The shrimp season was opened on June 6, with far less white shrimp being landed than in 1995.

Brown shrimp catches were somewhat above average in research trawls in 1996, but commercial catches were lower than average through late June. Numbers of blue crab captured by research trawls were above average in May and June 1996, with large numbers of mature females and sponge crabs being taken in Charleston Harbor.

The Channel Net season opened on October 17, 1995 and closed on November 30. The channel netters landed smaller than average shrimp in 1995, due to flushing of Winyah and N. Santee Bays by tropical storms. The shrimp baiting season opened on September 8, 1995 and closed on November 9. This season produced the most successful season to date, with a record harvest, 2.2 million lb. being landed by a record number of permit holders (over 13,900). The overall large catch of white shrimp in 1995 can be attributed to mild winter weather in 1994-95, large numbers of spawners, and good conditions for survival of young white shrimp, including adequate rainfall in summer.

Blue Crab Potting Surveys: Catch rates in 1995 continued less than average, perhaps a reflection of increased competition from commercial potting in some areas. Catch rates of female

blue crab appear to be stable. Overall, the blue crab fishery has been relatively stable in terms of landings, although price per pound and number of licences have increased in recent years.

Educational Displays:

During the year, staff participated in numerous public education demonstrations including a local seafood festival, a "blessing of the fleet", and a DNR open house. Staff made presentations at public meetings for commercial fishermen, the SCDNR Marine Advisory Committee, and the SCDNR Board concerning bycatch reduction in the shrimp trawl fishery.

FINFISH MANAGEMENT SECTION

The Finfish Management Section (FMS) is concerned with the management and development of South Carolina's marine finfish resources. During the past fiscal year this program carried out a number of State funded projects as well as Federally funded projects which are described below.

Anadromous Fish Project: Major activities in the NMFS-funded Anadromous Project during the 1995-1996 fiscal year has been the completion of a third year tagging study on American shad in the Edisto River. This study was initiated to determine the fishing mortality rate (FMR) on pre-spawning shad in the Edisto, where shad stocks are perceived to be in a state of decline. Results from the 1996 tagging study, in conjunction with those from similar studies in 1994 and 1995, and commercial catch and effort records, indicate that the Edisto shad population remains in poor condition and is in need of more intensive management.

Small Coastal Shark Project: A proposal to study small coastal species of sharks was funded by the Interjurisdictional Fisheries Program and sampling was initiated in August 1995. This project is using bottom longline gear to collect information on the species, size and sex composition, and relative abundance of small coastal sharks and parallel information on juvenile, large coastal species. Sharks are being tagged and released to provide information on exploitation rates and migratory behavior. A proposal to conduct this study for a second year was approved for funding.

Red Drum Project: This project, funded by the Marine Recreational Stamp Program is directed at evaluating methods of sampling adult red drum in coastal waters and characterizing these populations. Because of concerns about adverse impacts on critical spawning stock, none of the captured red drum were sacrificed for age determination. Fish were measured, tagged and released. Fin clip samples were taken from a sample of fish for potential mtDNA stock identification studies of the offshore populations. Continued sampling of ocean stocks should provide information on adult growth, stock identification and migratory behavior.

During the fall of 1995, longline sampling produced 299 adult red drum. Preliminary results from this work were presented at the annual red drum workshop held at Fort Johnson in March 1996. Sampling of coastal red drum populations will be continued during the fall of 1996.

Marine Game Fish Tagging Project: Over 9,000 fish were tagged by 1000 participating anglers. Approximately 2,000 tag kits were issued. During the fiscal year, anglers tagged 56 target species and 16 non-target species. Non-target species made up less than 1% of the total fish tagged. Charter and headboat captains tagged nearly 29 percent of the total fish tagged. Public support for the program continued to be strong. An angler newsletter summarizing 1995 activity in the tagging program was distributed to all who participated during 1995.

During the year, 518 anglers reported the recapture of 1078 tagged fish. A white marlin and an amberjack were recaptured off Cuba. A dolphin was recaptured off Cape Hatteras and a bluefish was caught off Daytona. A blue marlin was recovered off Pompano Beach.

Master Angler Project: This program was initiated in 1987 to provide recognition to anglers who catch trophy fish and to those anglers who practice conservation through the tag and release of game fish. During 1995-96, fifty-five anglers qualified for certificates in the citation fish division while forty fishermen were awarded conservation certificates for tagging and releasing at least thirty fish.

State Record Project: Records are currently maintained on sixty-nine species of marine gamefish available to South Carolina anglers. The following application was accepted:

FISH	WEIGHT	PORT	DATE	ANGLER
Bluefin Tuna	332-06	Murrell's Inlet	2/96	M. Stone

Sportfishing Tournament Project: FY 95-96 saw 76 competitions held along the coast which ranged in size from 10 to over 200 boats. Section personnel continued working closely with tournament organizers in planning and scheduling their events. State certified weighing scales were provided to 24 of these events. Most major tournaments have adopted minimum qualifying lengths for entries into their events while many even offering an additional award for the tag and release of fish to reduce the kill of fish while assisting scientific studies. The oceanic pelagic gamefish monitoring project was expanded in 1993 to include primary coastal pelagic game fish of special management concern. This catch per unit of effort survey was carried out at fourteen sportfishing tournaments during FY 95-96.

South Carolina Governor's Cup Billfishing Series Project: Established by Governor Campbell and assigned to the DNR by Governor David M. Beasley, this program has continued to flourish. The 1996 program was comprised of the six major billfish tournaments held May through July plus an interstate competition with North Carolina's Governor's Cup winners. These events emphasize the tag and release of billfish to minimize the harvest of billfish. Promotions of the program were significantly expanded through the creation of a news letter featuring 7 to 8 issues each year and an agreement with the Breeze Radio Network to be a media sponsor of the series.

A total of 113 different sportfishing boats from as far away as Ponce Inlet, Florida and Wilmington, Delaware participated in the Series. The concept of conserving our billfish resources carried over into everyday fishing with over 92 percent of the all billfish caught in FY 1995-96 being released. Primarily private funds and grants were used to finance the program. The program received over \$52,000 in private donations for the 1996 program. The 1996 series raised an additional \$8,560 for special marine fisheries conservation work.

Billfish Survey Project: The number of billfish (blue marlin, white marlin and sailfish) reported landed and released off our coast remained stable from FY 1994-95. A total of 243 billfish were reported caught off our coast in FY 1995-96. Sportfishermen's concern over the declining status of the billfish stocks world wide manifested itself in 92 percent of all billfish being released with 199 of these being tagged for science. No other state has achieved this annual level of release and tagging of billfish.

Marine Artificial Reef Program: During FY 1995-96, all privately maintained aids to navigation in place on artificial reefs and wreck sites were inspected. Eight new buoys were deployed on new and existing reef construction sites. A new system of replacing damaged buoys and reutilizing existing mooring systems was developed.

During 28 separate offshore field trips along the coast, 38 days were spent conducting monitoring activities on the state's marine artificial reefs. Close inspections of reefs were conducted to monitor physical stability and structural integrity of individual materials as well as to assess their biological effectiveness. Samples were taken of both sessile and motile organisms on several reefs constructed from ex-military vessels to test for the potential bio-accumulation of heavy metals and PCB's from these vessels. Newly deployed experimental concrete reef units were examined in place for the first time.

During FY 1995-96, ninety-three SCUBA dives were conducted, in which project personnel closely examined numerous reef structures on reef construction sites ranging from depths of 30 to 110 feet of water. Twenty-one stationary fish counts were conducted on seven selected reefs

along the coast where visibility and sea conditions permitted. Video and still photographic records were also obtained when possible.

During FY 1995-96, 15 separate artificial reef construction projects were completed in South Carolina's coastal and offshore waters on ten permitted reef sites. Site selection surveys were completed on five new reef construction sites, and permits were obtained on four sites.

ECONOMIC ANALYSIS AND SEAFOOD MARKETING SECTION

The overall purpose of this Section is to apply economic analysis to public and private sector issues in the coastal area and to continue the Division's commitment to providing South Carolina's seafood producers and consumers with practical market information.

Commercial Fisheries: A U.S. Department of Commerce MARFIN proposal, "Socio-Demographic Assessment of Commercial Reef Fishermen in the South Atlantic," began in January, 1995. The proposal focuses on providing socio-demographic data on commercial reef fishers needed to evaluate the potential impact of management alternative by the South Atlantic Fishery Management Council (SAFMC) and the National Marine Fisheries Service (NMFS). The lack of such data has been a major problem in the development of policies and management regulations for the snapper-grouper complex in the South Atlantic. Without data on commercial groups (users), such as boat owners, boat captains and crew members, it is increasingly likely that regulations will cause unexpected and undesirable impacts on these fishers. This project includes research by Clemson University sociologist Dr. Kenneth Backman at the Strom Thurmond Institute (STI). Activities included providing liaison support between the fishing community and STI and conducting extensive interviews in Florida and other states. Project activities in 1996 involved the completion of extensive in-person interviews (a total of 35 interviews were conducted during the 1995-96 period) and a mail survey of Federal permit holder by STI. Based upon a targeted sample of 437 Federal snapper-grouper permit holders, a response rate of approximately 54% was achieved. Data collected during this project is being analyzed and a final report is being prepared. The project's results will assist fisheries management agencies, especially the SAFMC, in determining the socioeconomic impacts of various fishery management options.

Recreational Fisheries:

Recreational harvesting of the state's marine fish and shellfish affects the economy of South Carolina's coastal counties, and perhaps the entire state. Fishermen, whether coastal residents or out-of-state vacationers, purchase goods and services from coastal businesses. These businesses, in turn, buy goods and services to meet their own needs, creating a positive economic "ripple effect" felt by many businesses and individuals in the state.

As the key marine fisheries management agency in the state, the Division of Marine Resources is frequently faced with decision-making tasks that require economic data relating to the state's recreational fisheries. Economic data collected in the past often fell short of meeting our need: it is either outdated, focused on too narrow an area (i.e. artificial reef fishermen), or not specific enough for the job at hand. To remedy this situation, a study was developed to determine the economic impact of saltwater recreational fisheries in South Carolina. A carefully developed series of surveys that will result in a comprehensive "big picture" view of the economic impact of South Carolina's saltwater recreational fisheries, as well as specific information on each fishery, including anglers' expenditure patterns and how fishing opportunities influence coastal visitors.

Specifically, a survey to determine the economic impact of saltwater anglers using head boats, charter boats and fee-based fishing piers was designed and implemented during 1996. Three methods of data collection were used: 1) distribution of angler data cards by volunteering head boat and charter operators to their clients, 2) the use of questionnaire drop-off boxes which had been installed at major saltwater fishing piers, and 3) periodic in-person intercepts of charter head boat and pier anglers. Using these methods, over 6,000 angler questionnaires were collected. Data collected during this survey is being compiled in a data base and will be

analyzed using an economic impact model. Data from this survey will also be used with other information to forecast future demand for recreational fishing services and related services in South Carolina's coastal area.

Preliminary work was also begun for estimating the economic impact of private boat and shore-based saltwater recreational anglers (including fishing tournament anglers) in South Carolina. Several organizations (e.g. University of South Carolina) with computer assisted telephone interview (CATI) capabilities were identified and will be asked to provide estimated costs for conducting a telephone survey and the related pretest. A pretest of the telephone questionnaire will be conducted in October, 1996 with one of these organizations.

A pretest of tournament oriented questionnaires was conducted during the Wild Dunes Yacht Harbor Billfish Tournament during June, 1996. Pretest activities were also scheduled for the Fishing for Miracles King Mackerel Tournament in Charleston during August, 1996.

Seafood Marketing: The Section's Seafood Market Specialist resigned from the Department to take an editorial position with Southern Living magazine. With the loss of this individual's unique marketing experience, the Section's capabilities to conduct seafood market development and consumer affairs activities has been hindered. Regardless, the Section remains a primary source of marketing information for in-state seafood dealers, processors, wholesalers and retailers, as well as a contact point for out-of-state suppliers, buyers and prospective dealers. It is also a readily available "answer line" for consumers with questions about seafood.

Other Projects: A need for nature based tourism research and activities has been identified. It is intended that the person who is hired through grant funding in FY 1996-97 for work on fisheries management plans will also be involved in projects related to nature based tourism and related natural resources activities.

ENVIRONMENTAL EVALUATIONS SECTION

The primary function of the Environmental Evaluations Section (EES) is to investigate, monitor and report on changes and alterations from both natural processes and human activity within South Carolina's coastal and marine environment. Permit applications and requests for comments to federal and state regulatory agencies which involve biological, physical and chemical alterations to marine, estuarine, and freshwater wetland and aquatic habitats are continually reviewed by EES biologists. These agencies include the U.S. Army Corps of Engineers (USACOE), the U.S. Coast Guard (USCG), and the S.C. Department of Health and Environmental Control including the Office of Ocean and Coastal Resource Management (formerly the S.C. Coastal Council, SCCC) (SCDHEC/OCRM). Comments from these reviews are drafted by EES staff and, after appropriate Division internal review, are forwarded through the DNR Coastal Environmental Coordinator to the DNR Director for Environmental Programs for inclusion into a single Department response for each application and certification request.

Other activities of the EES include the preparation of resource inventories and assessments; the review of federal and state environmental impact statements (EIS's) and environmental assessments (EA's), and detailed reports required of more complex proposed alterations; investigations of spills and discharges of toxic materials and contaminants, fish kills and other impacts related to maintenance of high water quality; participation in Natural Resource Trustee issues on contaminated sites; assistance in field sampling efforts for ongoing studies of the Environmental Studies Section of MRRI, as well as other agencies; and participation on numerous committees and task forces related to environmental impacts.

During FY 1995-96, the EES reviewed and commented on a total of 1609 SCDHEC/OCRM, USACOE, and USCG permit applications and certifications for various construction activities and alterations in coastal wetlands and estuarine and marine waters of South Carolina. Additionally, 223 responses to other requests by many of the same state and federal environmental quality agencies for programs (SCDHEC NPDES permit applications, state clearinghouse reviews,

etc.) were also processed. These additional requirements brought the total of EES reviews and reports to 1832 for this year.

The steady increase in the numbers of applications for docks and piers, boat ramps, and shoreline stabilization structures bears out the continued demand for water oriented development in coastal South Carolina. The documented increases in coastal development and the ensuing impacts to coastal resources continue to be a cause of significant concern to the integrity of fisheries resources and their associated habitats. These resources are very susceptible to degraded water quality and the chronic perturbations resulting from non-point source pollution, wastewater discharges and dredge and fill in wetlands. As development continues to increase and spread throughout the coastal plain of South Carolina, so does the number of permit applications for alterations to freshwater wetlands. The influx of new residents and visitors into the coastal region continues to put pressure on our transportation systems and utilities, as evidenced by numerous permit requests for wetland alterations resulting from upgrading and expansion of existing and construction of new infrastructure such as highways and wastewater treatment facilities. EES personnel continually interact with other programs at the MRD in support of investigations into the apparent effects of these activities on fisheries resources.

As the number of wetland permit requests increases, so does the need for appropriate and effective mitigation of impacts to wetland and aquatic habitat. EES staff have participated in numerous activities regarding mitigation and mitigation banking. In February of 1995, a process was initiated to develop statewide guidance on the establishment and operation of mitigation banks in South Carolina. The outcome of these efforts was the development of a document entitled "Joint State/Federal Administrative Procedures for the Establishment and Operation of Mitigation Banks in South Carolina. An interagency group of federal, state, and local regulatory and resource agencies known as the Mitigation Banking Review Team (MBRT) was also established. An EES staff member has been designated as the SCNDR team representative and plays an active role in all MBRT functions. The MBRT meets on a monthly basis to review mitigation banking proposals and to develop guidance on issues related to banking. To date, the MBRT has approved five banks statewide. An additional ten banks are currently under review. The MBRT has developed specific guidance on a number of issues, including bank siting, standards for establishing credits and debits, and the use of preservation banking.

EES personnel participated in numerous activities related to oil and hazardous material spill planning and response during FY 1995-96. These activities included active participation on the Area Response Committees (ARC's) established by the U.S. Coast Guard pursuant to the Oil Pollution Act of 1990 (OPA 90) for both Charleston and Savannah; participation in a comprehensive intensive oil spill response drill in February for all responders in the Charleston area; and participation on the Liquid Spillage Control Committee for Charleston Harbor. EES personnel assisted the DNR Environmental Program with consultation for emergency response and environmental damage assessment for the million-gallon diesel fuel spill that occurred in June along twenty three miles of the Reedy River in Greenville County. Additionally, EES personnel received notification of and responded to several minor coastal spill events, none of which resulted in natural resource injury sufficient to warrant formal damage assessment or compensation.

During FY 1995-96, EES personnel cooperated with the South Carolina Department of Health and Environmental Control (SCDHEC) in the investigation of several seasonal fish kills caused by low dissolved oxygen levels, usually resulting from algal blooms or the decomposition plant matter following the application of aquatic herbicides. Most of these kills occurred in ponds originally constructed as part of stormwater management systems in residential subdivisions or resort areas. Efforts continue to determine more effective ways to address this problem. In those cases where chemical toxicity was suspected as the cause of a fish kill, the Clemson University Department of Fertilizer and Pesticide Control (CUDFPC) was notified, as well. The

interagency Coastal Pesticide Advisory Committee (CPAC), continued to function successfully, meeting bi-monthly and working toward the common goal of protecting coastal resources through efficient pest management in South Carolina's coastal zone. This committee is viewed by many with regulatory and resource agencies, as well as representatives of various types of land use industries, as a very effective management tool.

In FY 1995-96, EES personnel continued their participation in a variety of issues being addressed collectively by representatives of State (SCDNR, SCDHEC, and the Governor's Office) and Federal (USFWS and NOAA) Natural Resource Trustee agencies (NRT's). These activities included the review of documents (work plans, site investigations, remedial investigations, feasibility studies, etc.) and participation in site visits to several existing and proposed Superfund sites in the coastal zone and inland areas. These sites include the Wamchem Superfund Site in Beaufort, the Helena Chemical Company Superfund Site in Fairfax, and, in Charleston, the Koppers Superfund Site, the Calhoun Park Site, and the National Park Service Site (S.C. Aquarium). EES personnel also participated in the planning process for environmental clean-up activities at Naval Base Charleston.

EES personnel continued to provide technical support to the South Atlantic Fishery Management Council through participation on the Habitat and Environmental Protection Advisory Panel. A number of fisheries habitat related issues such as offshore disposal of dredged material, beach nourishment, various impacts to offshore live bottom habitat, and impacts to estuarine wetlands and water quality were addressed. Comments from the Advisory Panel on pertinent issues or projects are forwarded to the Council for consideration.

Activities of a NOAA funded special area management plan (SAMP) for the Charleston Harbor estuary were begun in 1991 by the Office of Ocean and Coastal Resource Management of SCDHEC (formerly SCCC). Administered independently as the Charleston Harbor Project (CHP), this project will be completed during FY 1996-97 gathering information, identifying environmental problems and providing priorities for solution strategies to appropriate regulatory, governmental, resource and public entities on environmental and land use issues. EES personnel have continued to participate on a number of "topic-specific" Task Forces, the stated purpose of which is to provide direction for and assist in guiding the activities of the CHP.

SHELLFISH MANAGEMENT SECTION

The Shellfish Management Section (SMS) develops, implements, and supervises initiatives necessary for the effective management of the State's shellfish resources. The following activities were conducted during FY 1995-96:

Shellfish Season: The season for harvesting oysters and clams, as authorized in the S.C. Code of Laws, Section 50-17-365, opens annually on September 16th and closes on May 14th unless biological or other conditions warrant other times to open or close. This year the season for harvesting oysters and clams opened on September 16, 1995. Oyster season closed on May 14, 1996; however, due to water temperature and market conditions the clam season was extended to May 31, 1996.

Shellfish Field Management: In response to legislative changes that were implemented in 1986, shellfish acreage available for public use has nearly doubled. Currently, there are 56 State shellfish grounds. Annual assessments of State grounds are conducted during the closed shellfish season (May through September) to determine which grounds, based on an assessment of the resource, are suitable for commercial and recreational harvesting during the forthcoming season.

The most effective management strategy for preventing over-harvesting on State shellfish grounds has been to control the harvesting effort through a commercial permit system and require reporting of harvests from commercial fishermen by geographic area. Shellfish section personnel are involved in management duties concerning shellfish harvesting permits, cultivation requirements, mariculture permits, State shellfish grounds, Public shellfish grounds, whelk, scallop,

clam, and oyster resource assessments, mechanical harvesting permits and providing support to other DNR programs.

A statewide intertidal oyster survey initiated in 1980 is periodically updated in heavily harvested locations. Survey information continues to be furnished to the S.C. Department of Health and Environmental Control and various commercial interests. In cooperation with the DNR's Environmental Evaluations Program, special intertidal shellfish surveys are conducted upon request in estuarine areas where docks, bulkheads and other encroaching structures are proposed for construction.

Shellfish Culture Permits: Ninety-six commercial shellfish culture permits, totaling about 1,758 acres are currently under cultivation. A total of 42,083 bushels of oysters and 4,713,250 clams were harvested during this season from culture permits. Shellfish survey maps, maintained by the Shellfish Management Program (1:12,000 scale), are provided to shellfish culture permit holders and permit applicants. In addition, these maps are made available upon request to the South Carolina Department of Health and Environmental Control, the U. S. Army Corps of Engineers, as well as to private entities.

A series of shellfish maps have been developed from National Oceanographic Survey (1:80,000 scale) charts indicating locations and boundaries of the five management classifications of South Carolina shellfish bottoms: 1) Shellfish culture permit grounds 2) State shellfish grounds, 3) Public shellfish grounds 4) Water quality classifications, and 5) Grant areas. Boundary information is updated as changes occur.

Shellfish Culture Permit Planting and Assessment: All shellfish culture permit holders are legally required to plant 125 U. S. bushels of seed oysters, shell, or other approved cultch material for acreage under cultivation each calendar year. During this reporting period, one technician and two biologists monitored planting activities. Effective scheduling and communication has resulted in verification of all seed and cultch material planted in 1995. Recorded planting on commercial shellfish culture permits in 1995 was 45,617 U.S. bushels of seed oysters, 13,506 bushels of shell, 9,707 bushels of approved cultch material and 135,649 bushels of in situ cultivation for a total of 204,479 bushels.

From January 1 through June 30, 1996, 14,824 bushels of seed; 13,765 bushels of in situ cultivation; 570 bushels of shell; 3,434 bushels of clams and 3,922 bushels of approved cultch for a six month total of 36,515 bushels have been verified as planted on culture permits. All Shellfish culture permits not planted with the assessed quota must, by law, be canceled or reduced in acreage by the Department. This requirement mandates that many hours be expended each year in on-site monitoring and proper verification.

Mariculture Permitting and Management: Harvesting is allowed on Shellfish mariculture permits throughout the year. During 1995/96, the Shellfish Management Section processed four applications for clam mariculture permits. Twenty clam mariculture permits totaling approximately 753.7 acres are currently under cultivation, including Atlantic Littleneck Farms in Charleston and Beaufort counties, the largest clam farming facility in the world. One oyster mariculture permit of 15.8 acres is in operation.

Commercial Whelk Fishery: South Carolina's offshore whelk fishery began in 1978 as several commercial shrimp fishermen diversified in an effort to compensate for poor shrimp harvests. Using gear similar to shrimp fishing, harvesting subtidal knobbed and channeled whelks evolved as an alternative fishery. Production peaked in 1982 at over 32,000 bushels.

One hundred and seven permits were issued to trawlers for the February 9 - May 3, 1996 whelk season. Total production reported by dealers was 23,765 U. S. bushels with an ex-vessel value of approximately \$232,897.

Geographic Information System and Data Management: Shellfish harvesting data from each State shellfish ground, culture permit and mariculture permit is captured monthly and

displayed graphically on Shellfish Management Section computers in order to provide contemporary information for management purposes. Seasonal data is consolidated to illustrate harvesting trends over a ten year period. Graphic illustrations of harvesting pressure along with in situ resource assessments enhance the management of State shellfish grounds.

Several Geographic Information System (GIS) intertidal oyster survey maps have been produced and will be used for future shellfish resource management and environmental decisions. Cartographic data are now available in both soft and hard copy formats. These color GIS maps are sensitive to the changing dynamics of the coastal environment and allow more responsive management in areas recently closed by poor water quality.

Recreational Maps on the DNR's Home Page: In order to provide wider dissemination of recreational harvesting maps throughout the State, 56 maps of State shellfish grounds and 16 Public shellfish grounds have been digitally scanned and posted on the DNR's home page (<http://www.dnr.state.sc.us/marine/shell.html>). Recreational license requirements, shellfish seasons, catch limits and gear restrictions are included along with maps that may be viewed on-line or downloaded.

Recreational Shellfish Management: Recreational shellfish management activities involve the designation, marking and maintenance of Public shellfish grounds. Demarcation of certain State shellfish grounds designated for recreational harvest only has also been accomplished. During 1996, recreational shellfish signs were revised and acquired.

A law passed in 1996 (Section 50-17-370), redesignated Public oyster grounds as Public shellfish grounds. The new law enables the Department to modify boundaries and delete or establish grounds as considered necessary. Additionally, it prohibits the construction of docks or other structures within Public shellfish grounds and restricts the location of new Public shellfish grounds to areas that are a minimum of one-thousand feet from high ground, the current maximum allowable length of a dock.

Recreational shellfish areas are currently being realigned in accordance with the new law. Boundary and "Cull-in-Place" signs have been deployed on twenty-two grounds. Locations of all newly installed signs have been documented with a Global Positioning System (GPS) unit. This information will be entered into the Division's Geographic Information System for inventory purposes.

Relay of seed oysters from over-grown areas to Public shellfish areas, utilizing the R/V Oyster Catcher II, has continued. During the twelve month reporting period, a total of 8,512 U.S. bushels of oysters were planted on recreational areas. All relays were in Beaufort County.

Memorandum of Agreement - SCDNR/SCDHEC - Mutual Shellfish Interest: A Memorandum of Agreement (MOA) was signed between the SC Department of Health and Environmental Control (SCDHEC) and the SC Department of Natural Resources effective October 23, 1995 concerning the classification and restoration of coastal molluscan shellfish growing waters. This agreement establishes cooperative procedures between the two agencies to identify water bodies targeted for restoration based on quantities of shellfish and commercial and recreational harvest potential. Under the agreement DHEC will produce an annual report describing the harvesting classifications of coastal shellfish growing waters within the State, illustrating annual water quality trends.

MARINE RESOURCES RESEARCH INSTITUTE

The Marine Resources Research Institute (MRRI) provides the scientific expertise and capabilities to support the MRD's resource management and educational programs. Institute scientists work closely with the Office of Fisheries Management (OFM) to identify issues affecting the state's marine resources, assess the condition of the state's valuable fisheries and the habitats upon which they depend, and conduct the applied research and monitoring programs required to conserve, restore, and protect the state's marine resources. MRRI is also responsible for

developing technology to support the state's growing mariculture industry. The Institute's research programs address three primary management needs of the MRD: (1) fisheries monitoring and research; (2) environmental monitoring and research; and (3) mariculture research and technology development. Much of the mariculture research is conducted at the James M. Waddell Mariculture Center (WMC) located in Bluffton, S.C. MRRI staff also actively participate in cooperative research and education programs with the state's colleges and universities. Most of the Institute's scientists have adjunct appointments with the University of Charleston (UOC), the Medical University of South Carolina (MUSC), Clemson University (CU), South Carolina State University (SCSU), and/or the University of South Carolina (USC). Accomplishments for the Institute's research and educational programs during FY 1995-96 are described below.

FISHERIES RESEARCH PROGRAMS

Program Background: Since its inception, the MRRI has conducted monitoring and assessment programs which evaluate the condition of the state's fisheries including coastal reef fish, inshore gamefish, oysters, and clams. MRRI also: (1) develops and evaluates new technology and methods for assessing the status and trends of fisheries, (2) conducts research to identify the environmental factors and understand the processes controlling the abundance and distribution of fishery populations, and (3) works with OFM to define and evaluate management actions for restoring fisheries that have been over exploited. These programs are funded primarily through grants and contracts from the National Oceanic and Atmospheric Administration (NOAA), including the National Marine Fisheries Service (NMFS), the national and state Sea Grant Program, and revenues from fishing taxes and licenses.

Coastal Finfish and Crustacean Surveys: In 1995-1996, MRRI continued to monitor the status and trends of fish populations inhabiting offshore reefs and live bottom habitat as part of the NMFS-MRD Marine Resources Monitoring Assessment and Prediction (MARMAP) Program. As part of this program, 546 chevron trap, 45 long line, and 18 hook and line sampling surveys were conducted. These data were used to estimate the relative abundance and obtain life-history information for target species. Approximately 6,000 reef fishes were tagged including gag, greater amberjack, vermilion snapper, red porgy, white grunt, gray triggerfish, and scamp. Data reports were prepared on: (1) the status of reef fish stocks; (2) black belly rosefish life history; (3) white grunt life history; and (4) gag life history. Decreasing trends in the catch per unit effort for red porgy, vermilion snapper, and black sea bass indicated these populations were being over harvested.

MRRI also continued to monitor status and trends of living resources in shallow coastal marine waters in 1995-1996 through the NMFS-MRD Southeast Area Monitoring and Assessment Program (SEAMAP). This program monitored abundance, biomass, and composition of bottom and pelagic fishes and crustaceans (shrimps and crabs) throughout the region including SC, GA, and parts of NC and FL. No consistent increase or decrease in abundance or biomass of major fishery populations occurred from 1995 to 1996. These data have been transferred to NMFS and are available to fishery managers and scientist throughout the region. SEAMAP also functions as a source of tissue, blood, and whole specimen samples for other MRRI programs, as well as other state and federal projects. A study funded by the NMFS Marine Fisheries Initiative (MARFIN) utilized existing SEAMAP survey data to develop recruitment indices for king and Spanish mackerels. This study found that the catch of age 0 mackerels in the central South Atlantic Bight by SEAMAP could be used to predict the abundance of age 1 mackerels in the catch the following year. Data for development of age-length keys for whiting, spot, Atlantic croaker, and other coastal species were also collected as part of a joint SEAMAP/MARFIN project by MRRI staff.

Information collected by MRRI during 1995-1996 on life history and status and trends of coastal fisheries were frequently requested by and made available to the South Atlantic Fisheries

Management Council (SAFMC), Atlantic States Marine Fisheries Commission (ASMFC), and OFM.

Life History Studies for Coastal Species: Life history studies conducted by MRRI as part of MARMAP in 1995-1996 further corroborated the over harvested status of vermilion snapper and indicated that red porgy populations may be near a state of collapse. Gag grouper populations are also showing signs of over harvesting with females becoming sexually mature at smaller sizes and the population containing substantially fewer males than 15 years ago. An increase in the abundance of white grunt and gray triggerfish during the 1990's, species that were rare during the 1970's and 1980's, suggests that excessive harvesting of historically abundant species may have resulted in regional scale changes in composition of coastal reef fish assemblages.

Finfish Genetic Studies: The MRRI Genetics Laboratory conducted stock identification studies on several reef and estuarine species in 1995-1996, using mtDNA and nuclear DNA micro satellite technology. Specific projects included: (1) studies of the population genetics of Nassau grouper and jewfish; (2) stock identification research for gag; and (3) an evaluation of global population structure of wreckfish. Additional genetics research that is in progress at MRRI include stock identification studies for black sea bass, white grunt, spotted seatrout, and red drum. Research completed in 1995-1996 found that two rare groupers (Nassau grouper, jewfish) exhibited only small amounts of genetic variation at regional scales because these species undertake extensive migrations to spawn and have long-lived and widely-dispersed juvenile stages. Wreckfish genetic studies found distinct populations in the northern and southern hemispheres, but detected no genetic differences between the eastern Atlantic, Mediterranean, and western Atlantic wreckfish populations. Spotted seatrout studies found genetic differences among fish sampled from south VA, NC/SC/GA, south FL, and the Gulf of Mexico. Tagging and genetic studies suggest that there is only one stock of gag along the southeast Atlantic and Gulf coasts of the United States.

Estuarine Finfish Monitoring and Research: The objectives of MRRI's research programs for inshore finfish fisheries are to: (1) determine the status and trends for gamefish populations; (2) obtain the information and conduct the analyses required to manage these fisheries; and (3) disseminate the findings to resource managers, other scientists, and the public. During 1995-1996, the main emphasis of this program was to define abundance trends for red drum, spotted seatrout, southern flounder, sheepshead, and black drum between the Santee Delta and the ACE Basin. Funding for this work was provided by the U.S. Fish and Wildlife Service (USFWS) sport fish restoration fund, NMFS, a three state cooperative study (GA, SC, NC) funded by the NMFS MARFIN program, and the SC Marine Recreational Fishery Advisory Board (MRFAB). A guidebook entitled "Spotted Seatrout: Natural History and Fishing Techniques in South Carolina" was completed and will be distributed to the public in 1997. In addition, population analyses found that SC's spotted seatrout populations are being over harvested. A range of management actions, including reduced size and bag limits, that would provide the level of protection needed for this species and have minimum effect on recreational fishing were identified. MRRI continued to develop the use of standardized trammel net surveys and tagging studies as tools to collect the natural history data required for population analyses of southeastern estuarine fish populations. MRRI also conducted hydroacoustical surveys during the red drum spawning season to locate spawning aggregations. Several spawning sites were found, and environmental information about these sites was incorporated into the red drum data base. Age-length keys were produced or refined for priority species including southern flounder, spotted seatrout, weakfish, red drum, and sheepshead.

Sturgeon Bycatch Research:

MRRI also continued research on sturgeon in 1995-1996 to estimate the magnitude and fate of sturgeon captured incidentally by the commercial shad fishery. MRRI staff estimated that 183 sturgeons were captured as bycatch in the Winyah Bay shad fishery during the 1996 fishing

season, compared to 115 in 1994 and 201 in 1995. MRRI used these data to estimate that 13% of the sturgeons captured by shad fishermen died prior to release, about 19% were released alive with injuries of varying severity, and the remaining 68% suffered no apparent harm.

Shrimp and Blue Crab Research: Early life stages of economically important white shrimp and blue crabs move from offshore spawning areas to marsh nursery areas through coastal inlets. In 1994, MRRI initiated a Sea Grant funded study with the Skidaway Institute of Oceanography to determine the factors that influence the transport of early life stages of shrimp and crabs into estuarine nursery habitats. For this study MRRI and Skidaway staff collected extensive plankton, hydrographic, and acoustic data from the North Edisto Inlet. Subsequent analyses and integration of the biological and physical data in 1995-1996 provided a general understanding of the effects of weather patterns and currents on the processes controlling movement of early life stages of shrimp and crabs through this inlet. An acoustic (sonar-like) device deployed in the inlet continuously measured the vertical distribution for a range of particle sizes in the water passing through the inlet. Analyses of the acoustical data found that the vertical patterns for the smallest particles, which were mainly sediments, were controlled by tidal currents. These data were used to develop a mathematical model of particle transport for the North Edisto Inlet by the co-investigators at Skidaway Institute of Oceanography. The model should aid in explaining transport processes for shrimp and crabs. This research is scheduled to continue for several more years through funding from the SC and GA Sea Grant programs.

ACE Basin Reserve Research Program: During 1995-1996, MRRI continued biological and environmental quality monitoring efforts to define baseline conditions and characterize the floral communities on South Williman Island. Analysis of sediment samples collected in the ACE Basin as part of a joint study with the NMFS found that the reserve is a relatively pristine environment characterized by low levels of contaminant input. Chemical contaminant concentrations (trace metals, PAHs, pesticides), however, exceeded background concentrations at several sites. Water quality monitoring studies found that dissolved oxygen dynamics in the shallow tidal creeks of the Basin are complex and are similar to that observed for tidal creeks in the Charleston area. One of the water quality monitoring stations is located near the outflow of an impounded wetland and will provide valuable information on the effects of impoundment management on reserve water quality. Monthly trawl surveys of fish and crustaceans were continued in 1995-1996, and the long term data base that is being developed by this survey will provide information on seasonal patterns and long term trends for valued living resources in the reserve. The survey of floral communities on South Williman Island found vegetation on this island was similar to that on other islands in the ACE Basin. A major portion of staff effort in 1995-1996 was directed toward working with the U.S. Geological Survey (USGS) and SCDNR/ Water Resources Division to establish a meteorological station at the Bennett's Point Field Station. This station will provide important climate information for evaluating living resources trends data from the reserve. MRRI also initiated a survey to identify critical spawning habitat, determine population status, and assess the effects of harvesting on egg production of horseshoe crabs in 1995-1996. These data will be analyzed in 1997 and used to develop recommendations for managing horseshoe crab population in the reserve. Information from research efforts in the reserve were integrated into the reserve's education program that included boat trips, trail walks, teacher workshops, and a variety of outreach activities. In addition, staff sponsored a seminar series for the general public that was held in the Charleston and Beaufort areas.

Oyster Reef Habitat Studies: During 1995-1996, MRRI continued to examine the function and development of intertidal oyster reef habitats to define the value of these habitats to SC estuarine ecosystems. A major focus of these studies in 1995-1996 was sampling the experimental reefs constructed in 1994 to determine if they were reasonable mimics of natural oyster reef habitat. Preliminary findings indicated that diverse and abundant populations of red

drum, gray snapper, flounder, sheepshead, spot, white and brown shrimp, and stone and blue crabs occurred on both constructed and adjacent natural reefs. In addition, abundant populations of over 77 different kinds of prey for fish, shrimp, and crabs resided in the reef itself including small worms, clams, snails, shrimp-like crustaceans, and crabs. Oyster growth and disease status were similar between natural and experimental reefs. Similarities in the kinds and abundances of living resources between experimental and natural reefs suggest that the experimental reefs are reasonable surrogates for natural oyster habitat. A major accomplishment of this study in 1995-1996 was the creation of a data base for intertidal oyster reefs that included environmental (salinity, nutritional value of available food, sedimentation rates, chemical concentrations in tissues and sediments) and biological (disease status, growth, recruitment rates, kinds and abundances of resident and transient using reefs) information.

Bivalve Disease Monitoring: In 1995-1996, MRRI continued to determine the seasonal patterns of MSX (*Haplosporidium nelsoni*) and Dermo (*Perkinsus marinus*) in SC oyster populations. These diseases have devastated oyster populations in mid-Atlantic states and caused millions of dollars in losses over the last 35-45 years. A technical report summarizing over 24 years of research on the major pathogens affecting SC oysters was completed in 1996. This report documented that the oyster disease Dermo was present throughout the state. The percent of the population infected (prevalence) and the intensity of infections varied with location. Highest prevalence and intensity of infections occurred during summer and early fall. Dermo does not cause the high mortalities to SC oysters that it is reported to cause for northeast oysters. The trends data suggest that Dermo infection intensities were relatively low during the 1970s, increased during the 1980s, and remained elevated in the 1990s. MRRI also documented that MSX infections were present in 52% of the oyster populations examined since 1994. To date, however, no observed mortalities have been documented that can be attributed to MSX. Staff also documented that MSX occurred in historical samples as far back as the mid-1980s. MRRI also planned and initiated a study to establish baseline conditions for the oyster pathogens Dermo and MSX throughout the state. This study, which was conducted cooperatively with the OFM, sampled native oysters at 60 sites including Georgetown, Horry, Charleston, and Beaufort counties. Results indicated that Dermo was present at all sites, affecting from 28% to 100% of the oysters present.

Shellfish Hatchery Program: A secondary objective of MRRI's Shellfish Research Programs has been to develop the expertise and facilities to produce specific-pathogen-free (SPF) oysters in the MRRI Shellfish Hatchery, and in 1995-1996, approximately 10,000 SPF oysters were produced. These oysters were mainly used for internal research programs. Limited numbers were provided to researchers and graduate students at USC and UOC for various research initiatives.

ENVIRONMENTAL RESEARCH PROGRAMS

Program Background: MRRI's Environmental Research Programs conduct studies to evaluate the consequences of human-related activities on marine and estuarine resources. Specific studies include: (1) evaluating the impact of anthropogenic activities on critical habitats and populations; (2) quantifying the effects of pollution exposure on living marine resources; and (3) conducting toxicological studies to predict the impacts of pollution exposure on the marine environment. Information produced by MRRI about environmental conditions and issues is used by OFM and the Department to comment on permit requests.

Beach and Coastal Ocean Assessments: Due to beach erosion along much of the state's coastline, numerous beach nourishment projects have been initiated or proposed to restore the recreational value of beaches and provide protection to beach front property from storms. Because beach nourishment projects can adversely impact living resources, MRRI continued studies evaluating the effects of nourishment projects on marine resources during 1995-1996. The

Grand Strand Renourishment Project is one of the largest ever undertaken on the U.S. east coast. Once completed, the recreational value of approximately 24 miles of beach between Little River Inlet and Murrells Inlet will be improved. MRRI, in conjunction with geologists from Coastal Carolina University (CCU), continued to collect pre-nourishment monitoring data from the Grand Strand area during 1995-1996. Study objectives included establishment of baseline conditions for living resources along the beaches in the areas from which the sand was to be obtained, and identification of nearshore reef communities that may be adversely affected by nourishment operations.

Beach scraping provides a less expensive alternative for resolving coastal erosion and consists of using earth-moving equipment to relocate sand from the intertidal beach zones to critically eroded beach front habitat. In the spring of 1996, approximately 8,000 feet of eroded beach on Kiawah Island was scraped. Sixty days after scraping was terminated, MRRI conducted a study of bottom dwelling living resources to determine the extent of their recovery. Efforts during the remainder of the fiscal year were focused on processing the samples in the laboratory.

Research also continued on the mapping program that is being supported by the Minerals Management Survey (MMS) of the U.S. Department of Interior in cooperation with several state agencies, to identify sand resources and critical live bottom habitats along the SC coast. Primary efforts during 1995-1996 included completing nearshore mapping efforts at Folly Beach and Edisto Island, and collection of data for bathymetry and sediment properties for all borrow sites that have been used for previous nourishment projects in SC. The recovery rates for borrow areas at some locations has been found to be much slower than predicted and may represent a long term issue for beach nourishment activities.

Dredged Material Disposal Studies: In 1995-1996, MRRI continued research to establish baseline conditions for the Charleston Ocean Dredged Material Disposal Site (ODMDS). This effort represents a multi-year study of bottom sediments, bottom dwelling living resources, and chemical contamination in and around the ODMDS. All field work for this study was completed during 1993 and 1994. More than 1,200 samples that had to be processed in the laboratory were collected. All 1993 samples were completed and analyzed during 1995-1996, and an interim report was submitted to the U.S. Army Corps of Engineers (USACOE) and other interested agencies. Laboratory processing of the 1994 samples continued during 1995-1996, with more than 60% of the samples processed. A final report describing the overall study effort will be prepared and submitted to the USACOE in early 1997.

Disposal of dredged material in diked enclosures often creates wetland habitat that is attractive to a wide range of native and migratory birds. For example, the diked disposal areas in Jasper County created when the Savannah River was dredged provide feeding and nesting habitat for a variety of wading birds, including American Avocets and Black-necked Stilts. The U. S. Fish and Wildlife Service (USFWS) have raised concerns that the sediments in these impoundments may be contaminated with toxic chemicals and represent an environmental threat to birds feeding with the disposal areas. To address these concerns, a joint study between MRRI, NMFS, and USFWS was initiated. MRRI's part of this study was to describe the bottom dwelling prey species living in the sediments of two diked disposal areas. Sampling occurred in June 1996 and was limited to the submerged habitat that would be available to Black-necked Stilts. This information will be combined with results of the toxicology experiments conducted by the NMFS in 1997 and a final report that provides an evaluation of the risk the dredged material represent to birds will be prepared.

Environmental Monitoring and Assessment Program: During 1995-1996, MRRI continued the multi-year Environmental Monitoring and Assessment Program (EMAP) initiated in 1994 with NOAA to assess the environmental quality of estuarine resources in the southeast. During 1995-1996, MRRI collected samples for the 31 EMAP sample sites located in SC and GA and assisted

NOAA in completing the assessment for the 107 sites that were visited between Cape Henry, VA and Indian River Lagoon, FL. At each site information on water chemistry, chemical contaminants in sediments (trace metals and organic chemicals), physical properties of sediments (grain size analyses, total organic carbon, etc.), sediment toxicity, and characterization of the living marine resources was obtained. MRRI also conducted toxicity tests (amphipod toxicity test, seed clam growth assay, and the Microtox bacterial assay) for all stations sampled by EMAP. Analysis of these data will be used to estimate the area of SC and GA estuaries that have degraded environmental quality.

Tidal Creek Project: In 1995-1996, MRRI completed sample processing and assessment activities for a study funded by the Charleston Harbor Project and the MRFAB linking the degree and type of watershed development and biological condition in 24 Charleston area tidal creeks. This study found that the development of coastal watersheds adversely affected the sediment and water quality of tidal creeks as well as the kinds, abundances, and health of individual organisms living in creeks. Tidal creek channels were identified as major repositories for toxic chemicals. Natural creek sedimentation processes appear to retain much of the pollution loads that are released into estuaries, preventing pollutants from reaching deeper estuarine habitats. Sediments in creeks that drain watersheds with a long history of industrial and urban development have generally accumulated sufficient quantities of toxic chemicals and need to be considered for remediation. Sediments in many of the suburban watersheds have, however, not accumulated large amounts of toxic chemicals and do not require remediation. Regulatory and resource management activities for suburban watersheds should focus on reducing pollution loads and pollution prevention. As part of this study, MRRI evaluated an array of physical, chemical, and biological measures for assessing the environmental quality of shallow tidal creeks and associated salt marsh habitats. The upper reaches of creeks were identified as the most appropriate place to sample to assess environmental quality for tidal creek and marsh systems. Measures that were identified as "good" indicators of environmental quality were the concentration of pollutants in surface sediments, the physiological condition of individual resident fish, and the kinds and abundances of organisms living in bottom sediments. A final report for this study including development of recommendations for how to monitor the environmental condition of tidal creek systems will be developed in early 1997.

Harvester Study: In 1994, MRRI initiated a study to assess the impact of mechanical shellfish harvesting activities on living resources to address concerns raised by the USACOE and other agencies. The specific goals of this study were to: (1) review existing data regarding the physical and ecological impacts of mechanical shellfish harvesting on the marine environment; (2) use the literature review to identify issues for which additional research was needed; and (3) conduct the research to fill data gaps. A comprehensive report that summarized the existing knowledge on this subject and provided recommendations for additional studies was prepared in early 1995. Field work to address the issues identified were initiated and continued through the winter of 1996. Major study components included assessment of effects of harvester operations on: suspended sediments and turbidity plumes, recreationally important finfish, and bottom-dwelling invertebrates. Analyses found that the effects on turbidity plumes were ephemeral lasting only a few hours and never reaching levels that would cause mortality to fish and crustaceans. No differences in abundances of recreationally important fish were found between areas that had been dredged and adjacent natural areas. The assessment of impacts on bottom-dwelling living resources will be completed, and a report submitted to the USACOE in 1997.

Comparative Bioassay Study: This research was initiated in 1995 using funding obtained from the NMFS and was designed to evaluate the comparative effects of a representative trace metal (cadmium), pesticide (DDT), and polycyclic aromatic hydrocarbon (Fluoranthene) on estuarine species that are being considered for use in southeastern chemical contaminant

monitoring and assessment programs. The species tested included a locally abundant amphipod species, juvenile hard clams, grass shrimp, a copepod species, a rotifer species, and a marine bacteria. The sensitivity of all of these species was compared against a nationally accepted benchmark amphipod species. Laboratory bioassays, which included both aqueous and sediment exposures, confirmed that some of the test species were significantly more sensitive to the selected contaminants than the benchmark species. Only the seed clam, however, was more sensitive to all of the contaminants evaluated than the benchmark organism.

Bivalve Biomarker Study: This study began in 1995 and was funded by NOAA as a collaborative effort between investigators from MRRI, NMFS, and USC. It is designed to determine if physiological and cellular biomarkers provided sensitive early warning measures of anthropogenic activities on living resources. For this program, juvenile oysters produced by the MRRI hatchery and wild oysters were deployed at undeveloped reference sites and sites representing a range of degrees and types of development. After 1-3 month deployment periods, the oysters were retrieved and a variety of physiological (i.e., growth, reproduction, and condition) and cellular level indicators (accumulation of contaminants, expression of various stress proteins, cellular viability assays, etc.) were evaluated. Oysters deployed at many of the developed sites showed evidence of perturbed physiological and cellular functions.

Patricia Sheridan Wreck: In October, 1995, a barge containing dredged material from New York Harbor grounded just outside the entrance to the Charleston Harbor and leaked sediments contaminated with dioxin and other organic contaminants. Following evaluation by the Federal On-Scene Coordinator, who concluded that the spill "may represent an imminent and substantial danger to public health or welfare", MRRI assisted General Engineering Laboratories (GEL) in sampling living resources in the impacted area and at a reference area. The spider crab was the only large living resource found in the impacted area that occurred in sufficient numbers to allow tissue analysis to be conducted and was targeted for sampling. All specimens that were collected were turned over to GEL for processing. Results will be made available in 1997.

New Monitoring Techniques: MRRI conducted tests of semipermeable membrane devices (SPMDs) to determine their potential usefulness for field studies. SPMDs are plastic bags containing fish oil that mimic the way finfish collect organic contaminants across their gill membranes. Initial results indicate that the devices concentrate some organic compounds up to 1600 times their background levels and hold great promise to function as "model" fish. However, additional work will be required to determine the statistical validity and limitation of SPMDs.

MARICULTURE PROGRAMS

Program Background: As world fisheries continue to be over harvested the availability of seafood products will become more limited. In response, many countries including the U.S. have encouraged development of aquaculture as a means of mitigating the impact of the expanding demand for seafood products on over utilized fisheries. Current MRRI mariculture research programs include: (1) identification of culture requirements for valued marine and estuarine species; (2) examining stock enhancement as a tool for restoring and improving fisheries; (3) development and refinement of commercial mariculture farming technology for shrimp, clams, oysters, and fish; (4) development of technology that minimize the environmental impacts of aquaculture operations on receiving water bodies; and (5) providing extension services to transfer mariculture technology to the private sector. In addition, MRRI's mariculture programs routinely provide animals, expertise, and holding facilities to other state and federal programs.

Hybrid Striped Bass Aquaculture: MRRI conducted a number of hatchery trials during 1995-1996 to document performance and characterize spawning processes of domesticated white bass. In these trials, 3-year-old domesticated females produced 20% more eggs than 2-year-old females. No differences in latency, egg and fry production, and hatching success was detected between females that had previously been strip spawned and virgin females. Thus,

proper nutrition and care allowed brood stock to be spawned for several years without a loss of performance. Studies to identify methods for extending the spawning season for white bass found that maintaining ripe fish at temperatures of 11-14 °C allowed the spawning season to be extended by 3 months. The egg and fry production of domesticated white bass brood stock was similar to that of wild white bass indicating that the cultured fish were an acceptable alternative to wild fish in hatcheries. However, domesticated white bass did not attain sexual maturity for a minimum of 2 years. MRRI also developed tank rearing techniques for white bass and hybrid striped bass larvae incorporating previous MRRI research on the importance of lighting and tank color. In summary, results obtained in brood stock domestication and spawning research coupled with new larval rearing techniques should enable the striped bass hatchery industry to become more efficient and less reliant on wild brood stocks to produce fry.

Red Drum Studies: A marker that distinguishes cultured fish from natural wild fish is critical for evaluation of the performance of cultured fish after they are stocked in the wild. Such a marker is also critical for assessing the effectiveness of stock enhancement programs that rely on hatchery reared fish. Studies conducted by MRRI in 1995-1996 to address this problem focused on using growth patterns of otoliths (ear bones) of cultured red drum that are spawned out-of-season as a permanent, easy-to-make, easy-to-identify marker. Cultured red drum that were spawned out-of-season and stocked in the Colleton River in 1995 and recaptured in 1996 retained the marks on their otoliths suggesting these marks provide a permanent biological tag. The impact of stocked fish on the Colleton River red drum populations, however, could not be assessed because of the small number of fish that were recaptured. Recently, a net boat was purchased and will be put into service in 1996-1997 to improve sampling efficiency. During 1996, about 260,000 small red drum (1-2 inches long) were stocked in the spring while another 580,000 were stocked in the fall. Both groups were tagged with oxytetracycline as a second definitive marker to assist in identifying cultured fish from wild stocks. Sampling for stocked fish will be conducted throughout 1997 using the new net boat.

In addition, during 1995-1996, MRRI conducted a cooperative study with the GA Department of Natural Resources (GADNR) to estimate angler reporting levels using cultured tagged red drum. For this study, red drum were cultured to the minimum legal size (14 inches long) and stocked in the Charleston Harbor area and St. Simon's Sound area in GA. Stocked fish contained a tag with the inscription "reward" (typical inscription on fish released by state tagging programs) or "\$100 reward". The difference in reporting level between these two types of tags will be used to estimate the level of non-reporting as it is expected that captured \$100 reward tagged fish will all be reported. Data collection and evaluation for this study will occur during 1997.

Identification and Development of New Finfish Culture Technology: MRRI continued research in 1995-1996 for a collaborative SC/NC Sea Grant project to develop culture techniques for southern flounder. This program will require several years for successful completion; however, substantial progress was made for all tasks in 1995-1996. Spawning trials were conducted with southern flounder that used the hormones (GNRH and CPE) as spawning aids. Preliminary results indicated that CPE induced early spawning activities while the GNRH induced final maturation. The viability of flounder eggs varied considerably between females and among different batches from the same female. Larval culture trials showed that it was possible to rear fry using a combination of enriched rotifers and brine shrimp followed by natural foods. Juvenile flounder could be trained to accept dry commercial diets by slowly weaning them over a period of months from natural/live feeds to fish pellets. Juvenile flounder were produced in ponds using striped bass grow out methods, but harvesting was a major problem because of the ability of flounder to avoid seines. Southern flounder demonstrated the ability to tolerate low salinities (5 mg/l) for extended periods without mortality allowing the use of altered salinity regimes to control disease in culture systems. Artificial hybridization of southern and summer flounders

was shown to be possible but production of hybrid fry was low during these initial tests.

Development of Sustainable Mariculture Technology: Sustain ability of the mariculture industry along the SC coast is a major concern as the industry grows and expands. In 1995-1996, MRRI continued to focus its attention on identification and adaptation of technology that would ensure that the industry remains economically and environmentally sustainable using funding from the SC Sea Grant Program. As part of this program, staff at the WMC designed an integrated pond-based coastal aquaculture system in 1995-1996 which used culture pond discharge water to grow secondary crops. The integrated system included a new system for collecting, concentrating, drying, and pulverizing biosolids that accumulate in ponds and consume oxygen. During spring, three experimental ponds were configured using the integrated design and stocked with high densities of shrimp. Secondary crops used for this experiment were shrimp brood stock, oysters, mullet, *Tilapia*, and bait minnows. Performance of the integrated system was then compared against that of three control ponds that used conventional shrimp culture technology and high water exchange rates. Shrimp growth and survival in the integrated experimental systems were similar to that of control ponds. Growth and survival of the oyster crop was acceptable. *Tilapia* seemed more adept than mullet at utilizing waste material from the shrimp ponds, and bait minnow production was good. On a per-acre basis, the pond receiving waste water from the shrimp production ponds produced an additional 540 pounds of mullet, 563 pounds of *Tilapia*, 65 pounds of spot, 115 pounds of shrimp brood stock, 11,210 bait minnows, and 2,000 oysters. A portion of the biosolids that were removed from experimental ponds was used by a cooperating investigator from CU to determine the optimal mix of pond waste and natural soils for production of broccoli and bell peppers. At the proper application rate, the biosolids were more effective than inorganic fertilizers with an equivalent nutrient content. An unanticipated benefit of the new integrated system was that the removal of sludge deposits reduced the oxygen demand in the experimental ponds, increasing their carrying capacity for shrimp. A companion study found that a simple settling pond through which shrimp production pond water was recirculated was also effective at removing solids and lowering the oxygen demand in production ponds.

Shrimp Mariculture Programs: The importance of shrimp reproduction technology and the ability of SC shrimp farmers to obtain adequate quantities of disease-free seed shrimp for stocking ponds was highlighted in 1995-1996 when a shrimp virus destroyed much of the 1996 commercial pond-raised shrimp crop. The virus may have been bought into SC with seed from an out-of-state hatchery, and there was concern that it might be transmitted to wild shrimp populations in adjacent estuaries. In response to this emergency, WMC expanded its shrimp reproduction effort and supplied shrimp farmers with over 20 million shrimp seed. Additional newly-hatched shrimp larvae were provided to a commercial hatchery for rearing to seedling size. Farmers, however, still had to import more than half of the required number of seed for the 1996 crop from out-of-state hatcheries. The 1996 disease episode stimulated the SC shrimp farming industry to evaluate options for becoming self-sufficient in shrimp seed production. Loss of most of the 1996 crop has, however, made it difficult for the farmers to raise the capital needed to build a hatchery. WMC staff worked with the industry to develop designs and plans for a hatchery, as well as conducted all monitoring activities associated with the disease outbreak.

In addition to providing livestock, WMC staff conducted several important studies aimed at reducing the capital investment and operating costs of shrimp seed production including development of technology that reduces mortalities from pathogenic bacterial infections as well as evaluations of alternative feeds that reduces the cost of maturing brood stock. Initial findings suggest that: (1) enhancement of non-pathogenic bacteria populations may compete with and reduce the numbers of pathogenic bacteria in culture systems increasing larval survival; and (2) brine shrimp that have been enriched by feeding them special diets may be a economical

substitute for expensive conventional feeds.

EDUCATIONAL PROGRAMS AND ACTIVITIES

Program Background: As noted above, MRRI staff support the marine science educational programs of the state's colleges and universities. The MRRI also provides seaside facilities for student and faculty research programs and in cooperation with the UOC maintains a marine and environmental science library.

Graduate, Undergraduate, High School and Public Education: MRRI's commitment to higher education continued during 1995-1996. Staff functioned as research advisors and committee members for students from the UOC Marine Biology Program, the MUSC's Marine Biomedical and Environmental Sciences program, USC, CU, USC's Marine Sciences Program, and several other regional academic institutions. During 1995-1996, MRRI scientists guided the graduate research of at least 30 students from six State institutions, primarily UOC. Several members of the staff contributed to teaching graduate classes at UOC, USC, and MUSC. Other educational and training projects that MRRI staff supported included mentoring undergraduate and high school students in internship programs, providing technical support for teacher workshops and in-service training, conducting technical seminars and civic presentations, and participation in MRD/SCDNR promotions, such as the MRD Fishing Fair, the Sportsman's Classic and the Southeastern Wildlife Exposition. MRRI staff made over 77 presentations to the general public and scientific community reaching an estimated 12,954 individuals. A report summarizing the historic role of the MRD/MRRI in marine science education was drafted during the year.

Minority Training and Recruitment: During 1995-1996, MRRI continued to administer and provide technical assistance for MRD's Minority Training Program. The goal of this program is to provide minority students a positive learning experience in resources management and biological sciences thereby increasing the number of qualified minority candidates that apply for jobs with SCDNR. Six minority undergraduate students participated in a 12-week-long internship program that involved completion of mentor-guided research projects as well as hands-on resource management experiences. Student projects included laboratory experiments on the feeding behavior of shrimp, development of a bioassay based on blue crab development, synthesis of data on the performance of cultured striped bass hybrids, developing a public opinion survey, and working with the recreational fisheries tagging program. Students also discussed career opportunities in marine sciences with visiting minority scientists. Three of the students were funded through a minority training grant with the National Science Foundation, and three were funded through the MRD Minority Affairs Committee. As a result of this summers training effort, a student was hired temporarily to assist in one of the on-going research projects.

Marine Resources Library: The Marine Resources Library (MRL) continued to strengthen the collection as well as to improve access to the collection during 1995-1996. Over 503 new titles were added to the cataloged collection bringing the total volumes in the cataloged collection to 19,834. The total number of pieces in the cataloged microfiche collection increased to 1,316. The bound periodicals increased by 64 volumes bringing the total bound periodical collection to 8,290 volumes. Over 220 reprints were added to the collection during the year bringing the total for the reprint collection to 24,089 articles. During 1995-1996, the library also added four new serial titles. The library discontinued two journal subscriptions--one ceased publication and the other was not renewed by the project which had originally funded it. The library currently receives 388 serial titles through subscription, exchange, donation, and the Federal or State Depository System.

Library patrons checked out 4,473 books, journals, and/or reprints during 1995-1996, and the Librarian conducted fourteen lectures/orientation tours for 174 patrons. In addition, the Librarian trained the summer interns participating in the MRD Minorities in Marine Science Program to use the library. Library staff answered 5,174 reference or directional questions representing

an 11% increase over 1994-1995. Most of the increase was due to the increase of undergraduate users as well as the growing graduate student body. Interlibrary loan requests increased by 21% during 1995-96. The library also requested 503 items from other libraries representing a 92% fill rate. The library received 474 requests for material from other libraries. The library supplied these materials at a 72% fill rate. The Librarian upgraded the user guides for automated systems in the library during 1995-1996 and initiated work on a *Handbook for Graduate Students Using the Marine Resources Library*. In addition, the library held an open house as a part of the MRD Fishing Fair. For this open house the Librarian prepared four displays on topics of interest to the general public including cooking with seafood, careers in marine science, identification of sea shells and fish, and maintaining an aquarium. The staff also designed a bookmark giving information about the library to those attending the open house. During 1995-1996, the Librarian continued to serve as a consultant for the NMFS Charleston Laboratory because they had no library staff, and in June 1996 the NMFS contracted with the library to provide full library services. In 1997, the MRL and the NMFS Charleston Laboratory facilities will be combined substantially increasing the holdings for the library. The library continued its participation in the International Association of Marine and Aquatic Science Libraries and Information Centers exchange program that involves eighty-one organizations including foreign and domestic institutions in 1995-1996. This program provided the library the ability to acquire gratis copies of missing issues of serials. The library staff also continued to update the Marine Resources Center Technical Publications Series and to process requests for copies of these publications.

DIVISION OF WATER RESOURCES

Water Resources Advisory Committee

Lynn H. Youmans, Jr., Chairman	Furman
Tom W. Dunaway, III, Vice Chairman	Anderson
Whitemarsh S. Smith	Charleston
Earl Hayter	Clemson
Houston F. "Dick" Crater, Jr.	Gaffney
Lewis Walker	Sumter
Ben M. Gramling, III	Gramling
Ralph A. "Nick" Odom, Jr.	Fort Mill
Robert M. Rainey	Greenville
Steve Kinard	Charleston

The Water Resources Division conducts programs that foster water resources planning, protection and development. This is accomplished by conducting hydrologic studies of the state's surface and ground waters to insure adequate supplies of water for public supply, industry, recreational users, hydroelectric producers, and ecosystem maintenance. The Division serves as the focal point for climatological matters for State government and provides climate information and services to both public and private sectors. Environmental resource programs include work to control nuisance aquatic plants and animals; environmental permit review; watershed planning studies; administration of the State Scenic Rivers Program; and development of basinwide resource assessments. The Division is developing a digital spatial data base of soils, wetlands, land use, hydrography, transportation, and contours for the Coastal Plain and portions of the Piedmont area of the state. The agency's Home Page on the Internet was also maintained by the Division.

ENVIRONMENTAL AFFAIRS SECTION

The Environmental Affairs Section is responsible for the state's Aquatic Plant Management Program, zebra mussel program, environmental permit review, provision of laboratory services to other division and agency programs, and several river conservation-related programs. The latter includes the State Scenic Rivers Program, river corridor/watershed planning studies, Adopt-a-Landing, and educational outreach programs such as American Rivers Month and Beach Sweep/River Sweep.

Aquatic Plant and Animal Management

Nuisance aquatic plant and animal populations can adversely impact virtually all beneficial surface water uses including public and industrial supply, electric power generation, navigation and recreation. The Aquatic Plant and Animal Management Program seeks to prevent the introduction and spread of nuisance plants and animals and to manage and control nuisance populations when they occur. Major activities include public education, monitoring of public water bodies and the application of proven and approved control methods.

During the fiscal year, 20 lakes/streams were surveyed for aquatic plant problems and 29 water bodies (16,176 acres) were treated with aquatic herbicides and/or biological control agents. The Aquatic Plant Management Council met three times and approved the 1995 Aquatic Plant Management Plan. Almost half (47%) of infested areas identified in the plan received treatment. Grass carp stocked in upper Lake Marion in 1989-1992 continued to control hydrilla growth in over 9,000 acres in 1995. The cost per acre to control aquatic plants was \$173/acre (total funds: federal, state and local) with state expenditures of \$10.87/acre.

The Section Chief serves as co-chairman of the Zebra Mussel Task Force which met once

during the year. Staff distributed literature and presented displays on the zebra mussel threat to South Carolina. Six monitoring stations for zebra mussels were established and operated. Follow-up investigations were also made of reported zebra mussel sightings. Despite the presence of these animals in nearby states for several years, the zebra mussel is still not known to occur in South Carolina.

Environmental Review

The Section coordinates agencywide review of environmental permit applications and other actions affecting natural resources in the 38 non-coastal counties of the state and provides Water Resources Division input to this review process. This program seeks to insure that DNR comments and positions are scientifically sound, conform to agency policies and procedures, are consistent among projects and that the agency speaks with one voice. During the review period, 799 non-coastal environmental review requests were received, coordinated and responses provided. Site visits and coordination meetings were held with DNR staff, regulatory agency staff and permit applicants to evaluate specific projects. Regular coordination meetings were conducted for inter-divisional non-coastal environmental review staff. At least 95% of DNR recommendations were accepted and implemented by the agency or entity requesting agency review.

Laboratory Services

The Laboratory Services Program provides timely and accurate water quality and related analyses to support other programs of the Division and the agency. During the year, 1,232 samples were analyzed, many for multiple parameters, for the Aquatic Plant Management Program, various ground water programs, the Marine Resources Division and other miscellaneous projects. Ninety-seven percent of all samples analyzed were completed by the requested deadline. Staff continued training in the identification of zebra mussel larval stages. Staff also served on the Board of Directors for the S.C. Laboratory Management Society.

River Conservation Programs

These programs include the State Scenic Rivers Program, River Corridor Planning Program, public outreach activities related to rivers and management of the Edisto River Basin Project. The programs identify, protect and manage the state's outstanding and unique rivers; promote greater understanding of and appreciation for riverine resources; and provide technical and planning assistance to local entities interested in protecting their rivers and associated watersheds. Local values together with good scientific and technical information provide the basis for this planning program. Forty-two presentations on river conservation were given to various civic groups, conservation organizations, schools and professional meetings.

The Scenic Rivers Program is a preservation/conservation oriented program and is mandated to protect unique and outstanding resources as a public trust. This is accomplished by coordinating the program's responsibilities with the appropriate State agencies and riparian landowners in drafting scenic river management plans. During the year, staff coordinated the Broad, Lower Saluda, Lynches and Little Pee Dee Scenic Rivers functions. This included chairing the river's advisory councils and working to develop and/or implement management plans on the rivers. Scenic river signs were installed during the year. The Scenic Rivers Stewardship Program was created.

Staff coordinate the River Sweep portion of the annual Beach Sweep/River Sweep which is conducted each September. This involves identifying and recruiting volunteer coordinators to organize cleanups on rivers and lakes across the state and developing and publishing promotional materials for the event. In 1995, river sweep events were held at 75 sites on 71 waterbodies, involving approximately 4,500 volunteers. Forty-three tons of trash were collected.

The Adopt-a-Landing Program was officially introduced in June 1996. It is designed to promote the stewardship of South Carolina's boat landings by the citizens who use and appreciate

them. The program also serves as a tool to educate the public on the harmful effects that litter has on the environment. Participation in the Adopt-a-Landing Program is open to any community or civic organization, as well as businesses, individuals, and government organizations that wish to help control litter and improve the environment. A group chooses a specific landing it wishes to “adopt” and removes unsightly debris from the landing three times a year. At the end of the fiscal year, five landings had been adopted.

The Edisto River Basin Project is an example of a community-based resource management study for a basin or watershed. This project developed a comprehensive geographic system data base for the Edisto River Basin which was used by a task force of local citizens to develop a plan for managing their community’s natural resources. Over 150 individuals served on the Task Force (which met eight times) and its various expert committees and evaluated the basin’s natural, cultural, economic and recreational resources. A report titled “Grants, Technical Assistance and Incentive Programs: A Guidebook for the Edisto River Basin Project” was published during the fiscal year and distributed.

HYDROLOGY SECTION

This section conducts studies that provide information on the availability of water and the effects of withdrawal, storage and discharge from streams, lakes and aquifers. Findings of these studies aid in planning, formulating and implementing water resources policy and management alternatives to resolve problems related to the competitive usage of water and deterioration of water quality. The section strives to improve the quality and increase the quantity of hydrologic data. This is done through systematic monitoring of local and regional changes in our surface-water and ground-water systems. The section also models these systems to formulate management alternatives that minimize competing and conflicting demands and promote the conjunctive use of surface and ground water.

Hydrologic Investigations and Technical Assistance

Availability Requests: Staff responded to 380 requests for information and technical assistance from present and potential water users, including conduct of WADI surveys for location of bedrock wells and review of environmental permit applications.

Water-Well Network: In order to characterize hydrologic changes in the Black Creek and Middendorf aquifers, 83 water-level measurements were made to prepare the 1995 Black Creek potentiometric surface map, and 40 Middendorf wells were surveyed for the network. A draft Black Creek water level report was prepared. Three observation wells were constructed and added to the well network.

Flood/Drought Pre-Study: A preliminary analysis of streams during extreme conditions (flood and drought) was conducted. Six maps summarizing 10-year and 2-year average precipitation, temperature, and runoff were prepared. Eleven large-rainfall runoff events and six recession curves were analyzed. This information was used to develop hydrologic models for predicting high streamflows during floods and low flows during droughts.

Piedmont Study: To evaluate the ground-water supply potential of Piedmont aquifers, 12 relationships between streamflows and ground-water levels were determined. Models will be developed to study the recharge of ground water and surface water and the lag-time response to rainfall and drought.

Springs Inventory: Thirty percent of the springs inventory was completed. Staff inventoried 38 springs in the Piedmont region and six in the Pee Dee.

Geophysical Well Logging: 53,000 feet of geophysical logs were obtained to assist in defining water bearing units.

Aquifer Storage and Recovery: Two sites in the Grand Strand area were tested to determine the suitability of Coastal Plain aquifers to store treated drinking water to augment the capacity of

public supply systems during summer months.

U.S. Department of Energy Well Network: 95% of the drilling operations and 80% of the analytical work were completed during the year. One deep well (1,060 ft) was completed as a monitoring well at Miller in Allendale County. Nine water level recorders were installed. An open-file field activity report in western South Carolina was prepared for the Department of Energy (Savannah River).

Study and Simulation of Water Resources Systems

Parameter Estimation: A technical paper, coauthored with East Carolina University (North Carolina), was prepared that discusses a statistical model to extend flow records for stations with less than 22-years of data.

Wadmalaw Study: A three dimensional ground-water model was developed and a report prepared that assesses the impact of crop irrigation from ponds on the shallow aquifer system.

Effects of Reservoir Construction: A computer model and a double-mass curve analysis were prepared and applied to Lakes Murray and Bowen and to the Savannah River to determine effects of construction of large reservoirs on losses due to evaporation. The results indicated that such losses are minimal.

Hilton Head Project: In order to delineate natural and man-made drainage basins and characterize them to estimate impacts of future water demand and usage on water levels, water quality, and wetlands, 23 observation wells were installed and 20 aquifer tests made. Hourly water levels were taken at seven wells and two lagoon systems.

State Water Plan

Working sessions were held with various organizations and groups to solicit input and comments on the water plan. Based on these discussions, a fourth draft of the plan was prepared and submitted to the Water Resources Advisory Committee for review. In association with the plan, Clemson University developed a water-use prioritization model.

OFFICE OF STATE CLIMATOLOGY

State Climate Program

By maintaining a comprehensive state climate data and information service, the State Climate Office serves as the climatological focal point in South Carolina. This office compiles, stores, retrieves, and analyzes climatological data necessary for monitoring environmental change. Staff assist state and federal agencies in data acquisition and interpretation before, during and after periods of severe weather. The office also conducts applied climatological studies which provide information relating to interannual and seasonal prediction of weather affecting the economy and environment of the state. The drought response program develops and monitors drought indices, disseminates drought information and coordinates local and state responses to drought conditions.

During the fiscal year, this office processed 2,802 requests for climate information (average of 54 requests/week). Ninety-five percent of special requests for climate information were satisfied; the five percent not serviced were referred to the Southeast Regional Climate Center, the National Climatic Center or to private meteorologists. The majority of the unsatisfied requests were related to expert legal testimony and were handled by private meteorologists. The remainder of the requests were related to radar information or the verification of lightning strikes.

Each month, 221 monthly climate records were collected; 50 were received daily through the National Weather Service (NWS) Wire. Fifty weekly weather summaries were published and distributed. Staff provided 75 hours of service to the S.C. Emergency Preparedness Division (EPD) during periods of severe or threatening weather events. An additional 120 hours were expended in hazard mitigation efforts, technical support for training exercises, report preparation for risk analysis. Staff also worked with EPD to develop emergency response operating procedures.

Southeast Regional Climate Center

The Southeast Regional Climate Center is a federal grant program administered by the Division. Formed in 1989, the program provides a suite of climate products and services including dissemination of climate data and information to the Southeast region. Member entities include the States of Virginia, North Carolina, South Carolina, Georgia, Alabama, and Florida and Puerto Rico and the U.S. Virgin Islands. Staff assist users in the interpretation and best use of climate data and information with emphasis on inter-annual and seasonal predictions. Regional climatic conditions and impacts on natural resources are monitored and assessed. The Center obtains, quality controls, and maintains appropriate datasets to support climate services and applied studies. It also conducts applied climate research in cooperation with the NOAA Global Change Research Program on major regional needs which result in enhanced services.

During the year, 7,386 (2,102 invoiced) special requests for climate data and information were processed. This was a 112% increase in invoiced user requests over FY 1994-95 (1,877 requests invoiced). Requests included statistical programming for hourly weather elements, especially the dew point temperature and wind speed and direction. Datasets were compiled for several users in the academic community related to climate change, heavy precipitation, and wind speed. Some requests involved research and programming that extends the uses of the daily and hourly database.

1,101,860 contacts were logged on the DNR Internet Home Page providing climate data and information free of charge to users.

Activities during the year included expansion of dial-in capabilities for the Climate Information Rapid-Retrieval User System (CIRRUS) which processed 15,891 requests for climate data and information; enhanced Internet access and services; development of product value assessment tools; implementation of a regional geographic information system for climate analysis; integration of long-lead climate forecasts for use in predicting wildfires in Florida; completion of peach production model and new staff positions for scientific applications programming and geographic information systems data base development.

The following research projects were funded:

1. Development of a phenological model for peach growth in the Southeast (final year) - University of South Carolina, Clemson University, and University of Wisconsin - Milwaukee.
2. Develop a prototype external research program involving a mechanism to identify cooperating climatologists in the region. The prototype will be evaluated through conduct of research on coastal winds and long-lead forecasts using the system - University of North Carolina - Chapel Hill.
3. Survey of User of Climate Services Provided by the Southeast Regional Climate Center - University of Charleston.
4. Provide North Carolina Climatic Data and Services to the SERCC - North Carolina State University - Raleigh.
5. Provide Puerto Rico and U.S. Virgin Island Climatic Data and Services to the SERCC - University of Puerto Rico - Mayaguez.
6. Demonstration Project Testing the Use of the NWS Multi-seasonal Forecasts for Long-range Forestry Operations and Planning in Florida - Florida State University - Tallahassee.

NATURAL RESOURCES INFORMATION MANAGEMENT & ANALYSIS SECTION

During the fiscal year, the Computer Services and GIS staff were merged into one area. This section provides GIS, cartographic and computer support to the Division. It also conducts data base management which involves the development of digital data for the state for numerous natural resource, climate and hydrology layers. This digital spatial data base includes soils, wetlands, land use, hydrography, transportation and contours at 1:24,000-scale and color infrared

digital orthophoto quarter-quadrangles at 1:12,000-scale for the Coastal Plain and/or portions of the Piedmont of the state. The section also develops and maintains hardware, software, and network services for Division staff, including the maintenance of the DNR's Home Page on the World Wide Web.

Data Base Management

Staff continued to import and attribute digital line graphs, wetlands and land use, and soils data for various portions of the state. Specific project areas completed during the year were the Lower Santee, Catawba-Wateree, and portions of the Broad River basins. Data digitization was completed for 159 Digital Line Graphs and soils data for the Pee Dee and Lower Savannah River basins. Contracts for wetlands/land use and Digital Orthophoto Quarter Quadrangles continued into FY 1996-97. The major portion of data base development is jointly funded with federal government mapping agencies or is awarded to private sector vendors through a quality-based technical bid evaluation process. This has allowed the Division to retain minimal staff while obtaining high quality data mapped to National Map Accuracy Standards for 35-50% cost savings. The program received more than 50 requests for digital natural resources data during the year. Digital files were obtained by the U.S. Geological Survey, Center for Geologic Studies, Clemson University, the University of South Carolina, the S.C. Department of Health and Environmental Control, five regional Councils of Government and numerous planning firms. All divisional data will be made available over the Internet as data are completed.

The Division began a major initiative to integrate all climatology, hydrology, and natural resource data into a comprehensive data base management system. The Oracle data base management system was selected as the Division data base standard. Quality control filters were developed for the hydrologic well data to ensure adherence to standard data formats and attributes. These filters screen existing and new data for missing or inconsistent formats and identify problems. Work was initiated on conversion of the Permit Review data base and application and the CIRRU climatology data base to Oracle.

Systems & Network Management

A public access data server was installed to support DNR World Wide Web (WWW) home pages and data dissemination. Staff upgraded and expanded the WWW home pages including information from other Division sections and DNR divisions. The pages were transported to the newly installed IBM public access server and enhanced to include a variety of data access and browse functions. A Windows NT server was installed to centralize word processing, spreadsheet, and other PC-based software management. The internal Division communications and computing network was redesigned to provide multi-server access to various PC and workstation-based office automation and data analysis applications software. Numerous applications including the home pages were converted from the VAX system to the IBM and NT platforms. Installation of various applications software servers has allowed the Division to significantly reduce the number of software programs purchased and maintained through use of shared resources.

Applications Development & Management

In support of the Edisto Basin Project, the section produced a compact disc (CD) atlas titled: "Edisto River Basin Project Digital Atlas" Report Number 13. Approximately 175 maps, tables, charts, and graphics were digitized or otherwise generated for inclusion into reports, slides, or other presentation media. Maps were provided to the Law Enforcement Division to facilitate yacht anchoring at the 1996 Olympics near Savannah, Georgia. Maps were also produced for the Wildlife and Freshwater Fisheries Division to support eel fishing permitting for the coastal region.

WILDLIFE AND FRESHWATER FISHERIES

Wildlife and Freshwater Fisheries Advisory Committee

Campbell D. Coxe, Chairman	Darlington
Ed Muckenfuss, Vice Chairman	Summerville
Paul L. Wright	Greenville
Milton L. Brazell	Edisto Island
Joe Chapman	Dorchester
Obie Stokes	Florence
John E. Tanner	Hemmingway
Allen Cauthen, Jr.	Lancaster
Harry W. Kinard	Spartanburg
Tom Eleazer	Columbia

WILDLIFE MANAGEMENT SECTION

The primary objective of the Wildlife Management Section is to provide the best possible hunting opportunities for the sportsmen of South Carolina while ensuring the well being of all wildlife species. This objective is accomplished by providing technical assistance to landowners, conducting mission-oriented research and most importantly, operating a wildlife management area (WMA) program open for public hunting. During FY 1995-96, 1,314,063 acres of land were open to the public for hunting, and a total of 57,834 WMA permits were sold. Harvests of 61,832 deer and 12,664 turkey were recorded at department check stations. Turkey tags were issued to 42,006 hunters during the 1996 spring turkey season. Forty-six public dove fields (2271 acres) were available across the state. 2181 hunters participated in 87 public waterfowl hunts with a reported harvest of 3973 ducks. This represents a 26% increase in harvest and a 22% increase in harvest per gun per day. A 12-day Canada goose season was held with 3,676 permits issued and 1607 geese harvested. The efficiency of the WMA program is reflected in the cost accrued to provide public hunting land. Payment to landowners to lease hunting land during 1995 was \$2.27/acre for corporate land and \$0.39/acre for Forest Service land. The average cost per acre to lease public dove fields was \$0.92/acre.

The Wildlife Management Section's public relations activities are important in informing the public of management programs. Section staff made 395 public presentations before audiences of 19,470, prepared over 72 news releases, and developed technical management plans for a minimum of 938 landowners. Deer data analysis was provided to over 1500 hunt clubs. Section staff conduct numerous scientific wildlife surveys in order to monitor populations including 14 dove call count surveys, 51 quail surveys, 163 furbearer surveys, 19 waterfowl surveys, 16 alligator surveys and soft and hard mast surveys to look at wildlife food production. Staff investigated 1326 nuisance wildlife calls during the year and provided comments on 7 environmental review notices. Other state and federal agencies were assisted with technical information on 229 occasions requiring 80 mandays effort.

Field habitat management operations included 3531 acres planted, 2218 acres mowed, 6237 acres disced, 10,209 acres prescribe burned, 2888 acres fertilized, 561 acres limed, 699 acres treated with herbicide for weed control, over 3 million linear feet of dike mowed, 397 miles of roads maintained and 11,644 WMA and other signs posted.

The state is divided into six wildlife regions with a regional biologist responsible for all wildlife management activities within a region. Statewide project supervisors for major wildlife groups coordinate data collection, research, and surveys including deer, turkey, waterfowl, small game, furbearers, and alligator. Supervision is accomplished by periodic inspections of the various

projects, office conferences and reviewing reports and management plans. The actual performance of each project is tracked through department accounting records.

The following is a summary of the various wildlife management area and statewide projects throughout the state.

Wildlife Region I (Anderson, Greenville, Oconee and Pickens Counties)

Sportsmen harvested 12 bear, an increase of 71 percent. Three waterfowl areas were managed. Technicians planted nine public dove fields in the region including two adult/child fields.

Technicians planted 360 acres of annual and perennial vegetation and mowed 335 acres to enhance wildlife species. Technicians monitored 163 wood duck boxes with 88 used, producing 516 ducklings. Regional personnel cooperated with Clemson University, U.S. Fish and Wildlife Service, U.S. Forest Service, S.C. Forestry Commission, Duke Power Company, Crescent Resources, Ducks Unlimited, National Wild Turkey Federation, Greer Department of Public Works, local Legislative Delegations and S.C. Parks, Recreation and Tourism to promote and protect wildlife conservation. A workshop on industry and wildlife was held in the region. Youth deer, dove and duck hunts were conducted.

Wildlife Region II (Abbeville, Aiken, Edgefield, Greenwood, McCormick, Saluda Lexington, Richland and Calhoun Counties)

The Crackerneck WMA in Aiken County provided recreation for 2,605 hunters and fishermen with 108 deer, 15 wild turkeys, 69 feral hogs, 56 ducks, 44 bobwhites, 38 squirrels and a variety of other small game and fish being harvested. The project biologist spent 37 days in conducting the hunts on Crackerneck. Data were also collected on 178 wild turkeys taken from the rest of Aiken County.

Wildlife habitat in the Region was improved by planting 607 acres of various wildlife food plants. An additional 319 acres were improved by mowing, 110 acres treated with herbicide, and 70 acres were control burned. Five thousand bicolor lespedeza seedlings were planted. Twenty four acres were cleared for use as public dove fields and permanent wildlife openings. Eight public dove fields were provided, including one adult-child field. Sixty wood duck nest boxes were checked for utilization and three wood duck hens banded. Forty five wood duck nest box applications were investigated. Six gates or barricades were erected on roads to protect critical habitats. In cooperation with Champion International Corporation, nine acres on two roads were planted to control erosion and provide wildlife habitat.

On Crackerneck WMA, 23 acres of annuals were planted, 30 miles of road were mowed, and 50 acres fertilized. Twenty-three wood duck nest boxes were checked four times. Seven wood ducks were banded and two previously banded birds recaptured.

Over 200 people were contacted as project personnel manned the Wildlife Management Section display during Saluda County's Farm/City week. Four 4-H Club FACE plots in Abbeville and Greenwood and 10 in Aiken County were judged.

As a member of the SRS Site Use Committee, 68 land use proposals and 10 Forest Service compartment prescriptions were reviewed for their effect on wildlife populations. A major accomplishment was U.S. Department of Energy acceptance of a proposal to add 5,232 acres to Crackerneck WMA, which required numerous meetings and correspondence. Ten depredation permits were issued on the SRS, and 5 in Aiken County, for beaver, raccoon, coyote and other species. Management advice was provided to 3 landowners. Sixty-seven wild turkeys were trapped on the Savannah River Site and released on several state restoration areas. Management of Skinface Pond was carried out. Thirteen acres of millet were planted at the Head of the Creek WMA dove field in Lexington County. Fifty miles of WMA boundary in Aiken and Lexington Counties were posted with 505 signs. One Forest Stewardship needs check was conducted in Aiken County.

Biologists from the Columbia office made management recommendations on private lands, evaluated wood duck nest box sites and conducted doe quota investigations in Richland, Lexington and Calhoun Counties.

Wildlife Region III (Cherokee, Chester, Chesterfield, Fairfield, Kershaw, Lancaster, Laurens, Newberry, Spartanburg, Union and York Counties).

Participation in the region's public dove field program was significant with 17 fields available for public hunting within the Central Piedmont Region. During the 1995 opening day hunts, 815 hunters fired 18,671 shots (23 shots per hunter) and harvested 2,702 doves (6.9 shots per bird).

At the Department owned or managed properties, public dove fields were prepared and wildlife openings and firelines were maintained. These areas include the Crossroads and McBee Tracts in Chesterfield County, the Gray Court Tract in Laurens County and the Draper Tract, James Ross Wildlife Reservation and the McConnells Tract in York County.

Canada goose trapping, banding and relocation was conducted at various sites within the region during the year. Nuisance geese were trapped from private areas in Chester, Lexington, Richland, Union, and York counties. The total trapping effort included 631 geese trapped (566 adults, 65 goslings), 526 banded and 105 which had been previously banded. Thirty-four collar sightings have currently been reported. Future reports of numbered neck collared birds along with other banding data will be used to determine movement patterns, survival rates and population estimates. This information will be utilized to prepare future harvest recommendations.

A quail management demonstration area was maintained on WMA property owned by Champion International Corporation in Newberry County. At this area, 50 acres of linear food strips and other plantings were established for quail in cooperation with the Newberry Chapter of Quail Unlimited. Twenty acres of Duke Power Company rights-of-way located on WMA property within the region were planted in linear wildlife food strips. Two wild turkey management demonstration areas were maintained on WMA property owned by Bowater Incorporated in Union County (503 acres) and in Chester County (1390 acres).

The Sand Hills State Forest in Chesterfield and Darlington counties was provided technical assistance in further developing wildlife habitat. Quail and furbearer surveys were conducted and a public dove field was prepared. Nine big game check stations were maintained for collecting biological data.

Wildlife mortality at the Kennecott Ridgeway Mining Company facility in Fairfield County near the town of Ridgeway was carefully monitored through direct observation and counts of wildlife using the area. Wildlife observations averaged 2,315 per month and 17 mortality cases were documented this year. Goldmine and wildlife personnel are continuing to evaluate a variety of alternatives in an attempt to eliminate or reduce this mortality. A wildlife habitat development plan has been prepared for goldmine project lands adjacent to the mining facilities and efforts continued this year with the maintenance of wildlife openings and the annual preparation of a public dove field.

In an effort to promote positive public relations, project personnel participated in a number of other activities such as the "Hooked On Fishing Not On Drugs" fishing rodeo, youth dove hunts, big game antler scoring sessions and the Palmetto Sportsmen's Classic. Telephone calls and office visits remained high with 3,708 public contacts documented.

Wildlife Region IV (Berkeley, Charleston, Clarendon, Dorchester, Orangeburg and Williamsburg counties)

The U.S. Forest Service annual work plans were reviewed, and constant contact was maintained with U.S. Forest Service personnel to review post-Hugo timber and wildlife management activities. The DEIS and draft plan for the proposed Waccamaw National Wildlife Refuge were reviewed and comments provided to the U.S. Fish and Wildlife Service.

Assistance was provided to the Wildlife Diversity Section with management recommendations

on the Faulkenberry Wetland Mitigation Bank Site and the new Heritage Preserve tract in Charleston County.

The deer in the Dennis Center deer pens were routinely fed and maintained. Approximately 350 people visited the pen this year.

All region personnel spent considerable time planning and working the Fishing Rodeo at the Dennis Center.

A deer management initiative for the Francis Marion Hunt Unit was continued in cooperation with the U.S. Forest Service and the Law Enforcement Division. Assistance was given to the Law Enforcement Division in patrolling the Hunt Unit.

On the Canal Wildlife Management Area, 2,000 cedar and 2,000 pine trees were maintained as part of a cooperative project with the Freshwater Fisheries Section and the Corps of Engineers to improve small game habitat, provide future fish attractor material, and to reduce soil erosion. Nine thousand bicolor lespedeza plants were planted on this area to improve quail habitat. A small game management plan was designed and implemented for the Canal WMA in cooperations with the U.S. Army Corps of Engineers, the Small Game Project and Williamsburg County Chapter of Quail Unlimited. The Annual Management Plan for the Canal WMA was also developed and submitted to the Corps. Throughout the region approximately 522 acres were planted to wildlife food producing plants, 199 acres of wildlife food and cover plants were maintained and 26 miles of roads mowed on Wildlife Management Area lands.

One hundred and forty-seven wood duck nest boxes on Santee Cooper Wildlife Management Area were checked to record nesting and productivity data. Sixty-four wood duck boxes on the Sandy Beach Waterfowl Area were also cleaned and checked for usage. An intensive nest box productivity survey was conducted on the Sandy Beach boxes.

Data cards were distributed to cooperating deer clubs prior to the season, and deer data analyses were completed for 181 clubs and written reports prepared for 49 deer clubs within the Region.

Project personnel continued dove trapping and banding for a dove research project on two study areas (Berkeley-Orangeburg counties and Marlboro County). Ten trap sites were maintained and 176 doves banded. The objective of this study is to determine preseason population densities, harvest rates in the local population, productivity and annual survival rates.

Eight students from Macedonia Middle School participated in the mentor program established between the Department and the school.

A cooperative longleaf pine planting and wildlife opening development program was continued on Santee Cooper Wildlife Management Area in cooperation with the S.C. Public Service Authority and the Orangeburg Chapter of Quail Unlimited.

A wildlife and forestry demonstration area was maintained at Camp Harry Daniels in cooperation with S.C. State University and the U.S. Forest Service.

Two wetland focus area projects were continued under the auspices of the North American Waterfowl Management Plan. These efforts are designed to protect wetlands and associated upland habitats through cooperative joint efforts with partners.

The C.A.W.S. Basin Project is guided by a task force that meets monthly. Regular participants include several private landowners, two land trusts, four other conservation organizations and three public agencies. Many other landowners, organizations and agencies support the project and assist on an "as needed" basis. Numerous landowners have been contacted about the project through workshops, meetings, and personal contacts. Land protection priorities have been developed and strategies initiated to protect those with the highest priority. Much of the area is owned by corporate landowners and one major effort is to develop ways they can protect their properties and defend these actions to their shareholders. Several properties are moving toward protection actions.

Five hundred (500) persimmon trees were planted on the Francis Marion Hunt Unit in cooperation with the Hellhole Coon Hunters Association, the Furbearer Project and the U.S. Forest Service. These trees will help compensate for the loss of mast production due to Hurricane Hugo.

Two hiking trails and two camp sites have been opened on the Santee Cooper and Sandy Beach WMA's in cooperation with the South Carolina Palmetto Trail Project. A deer hunt for handicapped individuals has been held on the South Tibwin portion of the Francis Marion Hunt Unit in cooperation with the U.S. Forest Service.

Special feral hog hunts have been initiated on the Waterhorn and Hellhole WMA's of the Francis Marion during July and January-February of each year.

Wildlife Region V (Allendale, Barnwell, Bamberg, Beaufort, Colleton, Hampton and Jasper counties).

Primary activities in Wildlife Region V are management of public lands for outdoor recreation including public hunting, assisting private landowners with natural resource management on their lands, working with other public agencies on natural resource issues and public education about natural resource management. These objectives were accomplished in 1995-96 on 20,744 acres of both state-owned wildlife management area (WMA) lands and cooperative WMA lands which were either leased by the South Carolina Department of Natural Resources (SCDNR) or under management agreement with SCDNR.

Regional biologists gave 84 talks on wildlife management and conservation to 2,854 persons representing a wide variety of groups including university wildlife and forestry classes, hunting clubs, elementary and high school classes, and Webb and Palachucola WMA public deer and quail hunters.

One pine timber sale was held on Webb WMA this year. A buyers "operator-select" pine pulpwood sale was held to thin pines in 20 acres. A bid of \$25.25 per cord, to be paid weekly as the pines are cut, was accepted for this sale. Cutting of this timber has not yet been completed. Cutting of pine timber from sales 3-31 (sawtimber tinning) and 3-32 (pulpwood select thinning) is still underway. Cutting of pine timber on Palachucola WMA sales PAL-2 and PAL-3 is still underway. Two emergency sales of pine beetle infested trees was held on Palachucola WMA and bids of \$13,188.86 and \$3,129.84 were accepted. One hundred and eighty acres were planted in longleaf pines by a contractor and our staff.

Herbaceous plantings, consisting of corn, sorghum, brown-top millet and mixtures of various seeds, were carried out on 290 acres on Webb and Palachucola WMA's in fields and openings. Other management activities on these two areas included prescribed burning of 1,700 acres, mowing of vegetation, maintenance of roads (including grading, filling holes, installing culverts, topping sections of roads with crusher-run rock), and maintenance of buildings and grounds. One hundred thirty-eight (138) wood duck nest boxes were inspected and maintained at Webb, Palachucola, Lake Warren and Lake Brown.

Technical guidance in wildlife management was provided by regional biologists and technicians to landowners and managers on 89 different occasions in region five this year. In addition, quota applications were received from 864 cooperators in the Antlerless Deer Quota Program. Applications were evaluated and 29,706 antlerless deer tags were recommended to landowners, managers and hunting clubs. Biological deer harvest records, consisting of 10,033 animals were received from antlerless deer quota cooperators. Harvest records were analyzed by biologists and recommendations for 1996 were provided to cooperators. Assistance was provided in deer-spotlight surveys, deer collection, pit-fall trap construction and other activities on two cooperative research projects in the region. Technical assistance activities accounted for over 300 man/days or 10 percent of region five project time.

Wildlife Region VI (Darlington, Dillon, Florence, Georgetown, Horry, Lee, Marion,

Marlboro, and Sumter Counties)

Wildlife openings on the SCPSA Pee Dee Station Site WMA in Florence County totaling 10.6 acres were planted in rye and clover. Wildlife plantings at Lake Wallace WMA in Marlboro County included 18 acres of sunflowers and 30 acres of browntop millet. Another 10 acres of sunflowers, 10 acres of corn, and 55 acres of browntop millet were sown in three public dove fields on MSF.

Project personnel assisted Clemson University researchers with the cooperative mourning dove research project in the Bennettsville area.

A management plan was prepared for the G-P Co. Bucksport/Oliver tracts in Horry Co. relative to SC DOT/USA COE off-site mitigation credits.

Regional Wildlife Biologist Mark Bara was a co-author of a publication titled "Southeastern Deer Study Group Annotated Bibliography 1991-1995.

Wildlife habitat development activities on wildlife management areas through clearing and seedbed preparation, planting, and maintenance of wildlife food plots and tree and shrub plantings, consumed approximately 160 man days or 14.5 percent of project activities.

ACE Basin Project

The Ashepoo, Combahee and Edisto (ACE) River Basin Project is a comprehensive, multifaceted effort to protect in perpetuity a nationally significant 350,000 acre coastal wetland ecosystem. Wetlands within the project area provide critical habitat for resident and migratory waterfowl as well as a wealth of other wetlands-dependent wildlife species including five federally-listed endangered/threatened species (southern bald eagle, wood stork, shortnose sturgeon, American alligator, and loggerhead sea turtle). Accordingly, the project area, representing one on the largest undeveloped wetland complexes along the Atlantic Coast, has been identified as a principal focus area of the North American Waterfowl Management Plan's Atlantic Coast Joint Venture.

The project is jointly funded and directed by the ACE Basin Task Force consisting of: S.C. Department of Natural Resources (SCDNR), Ducks Unlimited (DU), The Nature Conservancy (TNC), U. S. Fish and Wildlife Service (USFWS) and private landowners. To date 122,064 acres of land have been afforded permanent protection. Specific protection accomplishments in 1995-1996 include the formation of the Nemours Plantation Wildlife Foundation (9,800 acres), the donation of 370 acres to D. U., and the placement of conservation easements on 3,478 acres. Conservation easements now total 39,374 acres.

Donnelley Wildlife Management Area

A part of Wildlife District VIII, Donnelley is located in eastern Colleton County adjacent to U.S. Highway 17 near Green Pond. This unique property of 8,048 acres encompasses a diversity of wetland and upland habitat types including: managed wetlands, backwaters, forested wetlands, tidal marshes, agricultural fields and a variety of forest types.

A total of 164 acres of agricultural plantings were made for public dove fields. Prescribed burning was conducted on 1,725 acres of uplands to improve wildlife habitat. Water level management and agricultural plantings were utilized on 2,046 acres of wetlands to provide wintering waterfowl and wading bird habitat. In conjunction with wetlands management, 42,240 linear feet of dike were maintained by rotary mowing. Thirty-three miles of roads were maintained by rotary mowing and grading. Four miles of roads were graveled. Twenty-five acres of wildlife openings were maintained to provide food and cover for forest dwelling wildlife. One hundred fifty-three wood duck boxes were maintained. A minimum of 925 individuals visited the area. Organized groups using Donnelley for educational purposes included school groups, teacher workshops and conservation organizations.

Bear Island Wildlife Management Area

Bear Island Wildlife Management Area, Wildlife District VIII, is located in Colleton County, and consists of approximately 12,000 acres including 5,319 acres of managed wetlands; 5,005

acres of tidal marsh; 1,227 acres of woodlands and 404 acres of agricultural land.

Active water level manipulation was practiced on the managed wetlands to provide optimum habitat conditions for resident and wintering waterfowl, shorebirds and wading birds. In conjunction with wetlands management, maintenance was performed on 60 water control structures and 90 miles of dikes, roads and trails. One hundred thirty-six acres of agricultural fields were planted and manipulated to provide foraging habitat for upland wildlife.

Public fishing on the area (April 1 - September 30) provided an estimated 5,000 man-days of recreation. Other recreational uses of Bear Island including birdwatching, hiking and wildlife photography provided an estimated 3,000 man-days of recreation. A kiosk and observation blind were built to provide additional access to the general public.

Bear Island provides camping facilities and accommodated a variety of groups including universities, high school classes, Scout troops and other conservation groups. Personnel provided numerous tours and educational programs to these and similar groups.

Santee Coastal Reserve State Project

Santee Coastal Reserve is located in southeastern Georgetown County and northeastern Charleston County between the North Santee River and Cape Romain National Wildlife Refuge. It consists of two barrier islands and a mainland portion. Eleven thousand, six hundred and sixty-one acres of impoundments are managed for wintering waterfowl. Waterfowl numbers on SCR during the Mid-Winter Survey were 44,631. The southernmost flock of lesser snow geese in eastern North America overwinters here. The upland acreage of the mainland is managed for public deer hunting. Santee Reserve is managed as a multiple-use area with waterfowl as the featured species group. Other target species include deer, turkey, Atlantic loggerhead sea turtles, bald eagles, red-cockaded woodpeckers, osprey, quail, and numerous wading and shorebirds. Two thousand wood duck nest boxes are constructed on this project annually for free distribution to private landowners. Public utilization of the area is high for a Wildlife Management Area with over 10,000 annual man-use days. This utilization includes camping, hiking, biking, canoeing, horseback riding, guided tours, hunting fishing, outdoor academic classes and bird watching. All interpretive signs on all 4 trails are color coded and keyed to a large map at the trailhead kiosk. Guided tours and technical and non-technical lectures were presented to over 1,000 visitors. Sixty acres of forest openings are planted for forest birds and mammals. Waterfowl and shorebird management is accomplished by water level manipulation in the impoundments. One hundred and one pair of endangered wood stork were documented as nesting on SCR this spring. Documented wading bird nesting included the following number of Anhinga - 79, great blue heron - 120, great egret - 350, and osprey - 40. Bald eagle production in the West Territory was 2 chicks with a total of 6 chicks produced on the entire property. Additionally the South Carolina Department of Natural Resources manages the 1,100 acre Washo Reserve through cooperative agreement with The Nature Conservancy. Utilization of the 800 foot boardwalk in the Washo Reserve is at an all-time high. Boardwalks and wildlife observation blinds are maintained in conjunction with the Marshland Nature Trail and the Bike/Hike Trail.

Furbearer Project

Technical assistance: Five hundred two depredation permits were issued statewide to property owners suffering damages from nuisance furbearers. Numerous on site visits were made to assist landowners with animal damage control. Beaver control workshops were conducted for landowners dealing with nuisance beaver situations. A Nuisance Wildlife Control Operator's List was produced to provide the names of companies and individuals providing service in each county. One hundred ninety-three participants were enlisted. Technical assistance brochures, slide programs and videos were developed and distributed to assist landowners in controlling nuisance furbearers.

Education: A four day conference on nuisance wildlife damage control was co-hosted with

Clemson University. The conference, which was attended by 130 participants, was designed to accelerate the privatization of wildlife damage control. Five presentations on furbearer research and management were given at professional conferences. The bi-annual furbearer news bulletin was produced. A statewide youth raccoon hunting championship event was hosted with 35 youths in attendance. The event included seminars on sportsmanship, gun safety and compass navigation.

Harvest Monitoring: The level of commercial fur harvest is monitored annually through mandatory reports of commercial licensees and through a fur tagging system. These surveys reveal that fur values for some species improved again this year. Overall, fur values remained well below the levels of the early 1980's but are approaching levels which are expected to result in increased participation by sport trappers. The number of sportsmen participating in the commercial fur harvest is 66% below the peak of 1,395 licensees during the 1987-88 season. While there was no increase in the number of fur harvesters, the total catch of furbearers did increase over the previous season by 43%. The commercial harvest of all furbearers combined still remains 61% below the twenty-year average. The annual requirements outlined by the Convention on International Trade on Endangered Species (CITES) were submitted to the U. S. Fish and Wildlife Service for export approval of South Carolina bobcat and river otter pelts. Population trends and harvest estimates were predicted in order to justify the continued harvest of these two species.

Population Monitoring: The annual Scent Station Survey included 1,590 tracking stations to determine the relative abundance of bobcats, foxes, raccoons and free ranging dogs. The annual Raccoon Field Trial Survey was conducted to analyze raccoon hunting success data for comparisons between regions, years and seasons within years. This year's survey recorded the hunting success of 1,486 hunt parties. The invasion of coyotes into South Carolina continues to be monitored. Current information indicates that the animals are established in all counties bordering the Savannah River. Random observations of coyotes have occurred in nearly two-thirds of the remainder of the state. Furbearer population monitoring through determination of age structure continues using a process of cementum analysis.

Habitat Improvement: A project was conducted cooperatively with local raccoon hunters to restore soft mast producing trees to the Hurricane Hugo impacted regions of the Francis Marion National Forest. Twenty beaver pond levelers were distributed to qualifying landowners under the Partners for Wildlife Program.

Research: Furbearer related research included:

- 1) Impacts of sport raccoon hunting on deer behavior and deer hunting success rates
- 2) Participation in regional and international efforts to develop international humane trap standards.
- 3) Validation of the Scent Station Survey and Raccoon Field Trial Survey using known levels of raccoon population reduction.
- 4) Determination of the distribution of mink in South Carolina tidal marshes.

The annual Commercial Fur Harvest Regulations brochure was produced and distributed to the furbearer resource users. Two hundred eighty fox and raccoon field trial permits and 17 fox running pen permits were issued.

Statewide Deer Project

Deer Harvest Summary: The annual statewide deer harvest summary was completed, printed, and distributed. This task revealed that during the deer season of 1995, a minimum of 148,123 deer were taken in South Carolina. This included 76,334 bucks and 66,243 does taken by hunters and 5,546 deer of unknown sex that were struck by vehicles. These figures represent the greatest number of deer ever reported taken in South Carolina. Harvest figures for 1995 showed a 6.6% increase over 1994 and a 3.7% increase over the previous record harvest which

was established in 1993. Harvest trends in the 28 county coastal region have remained relatively stable since 1990 and for the third consecutive year, more female deer (52%) were harvested in this region than male deer (48%).

Antlerless Deer Quota Program: The antlerless deer quota for the 28 county coastal plain area was administered by the Deer Project. This program was modified several years ago to include a choice of either-sex days or tags and a \$50 application fee was established. In 1995 72,144 tags were issued to 2,570 cooperators on over 4.4 million acres of land. In addition, over \$135,000 was collected, deposited and expended as required by the enabling law.

Piedmont Antlerless Deer Tag Program: The antlerless deer tag program for the piedmont was administered resulting in the issuance of 43,858 tags to just over 22,320 applicants. Over \$219,000 was collected, deposited and expended as required by the enabling law.

Antler Records Program: Wildlife Management Section biologists conducted 20 antler scoring sessions during the year, at which, 458 sets of antlers were scored using the Boone and Crockett system. This effort resulted in the addition of 177 sets of antlers to the state records list. Data for the successful heads were entered, verified and edited and certificates were mailed to each owner. A new Antler Records Certificate was developed by the Deer Project cooperating with the Conservation Education and Communications Division. A total of 3,047 sets of antlers have qualified and are included on the Antler Records List since the program's inception in 1974.

Research: The Deer Project was involved in four research efforts during the year. The first project involves an ongoing study concerning crop damage and deer densities in Hampton and Jasper Counties. In this study, monitoring of crop damage and deer condition have been conducted through a period when efforts to reduce deer density were underway. The second project is an investigation of the mortality and dynamics of a Jasper County deer population. Information from this study will lead to a better understanding of deer in the lower coastal plain. An investigation of the biology and condition of deer at Sea Pines on Hilton Head Island is in progress. This study is the first urban deer study the Wildlife Management Section has been involved in and it may provide information relative to future conflicts between deer and humans in urban settings. The final study in which the Deer Project participated in 1995 involves a complete analysis of the statewide deer harvest records from 1987-1994.

Wild Turkey Project

Six new sites in 4 different counties were stocked with 97 turkeys. Another 95 turkeys were sent to North Carolina to assist in their restoration efforts. A total of 190 sites have been stocked with 3,285 birds since 1976.

The summer turkey survey provides information on reproductive trends and success of restoration. During the summer of 1995, 1,839 observations resulted in the sighting of 16,618 turkeys. Overall observations increased with the poult to hen ratio of 4.2 increasing slightly from the previous year indicating good reproduction last summer.

No fall season was held in 1995. The 1996 spring season resulted in 12,664 birds checked and 42,006 sets of tags issued. A portion of all 46 counties now have an open spring gobbler season.

Six National Wild Turkey Federation (NWTF) fund raising banquets, 4 board of director meetings, and the Technical Committee meeting were attended. The Southeast Wild Turkey Committee meeting held in Louisiana was attended. At least 36 NWTF Super Fund projects were reviewed and funded. Total Super Fund expenditures for projects to benefit turkeys were in excess of \$78,000 in 1995-96.

Statewide Alligator Project

During the reporting period, 753 nuisance alligator complaints were received (UP 15% from the previous year) and about 280 alligators were captured and processed (up 30% from the previous year). Three alligator hide sales were conducted generating \$103,771.03 in sales, the

state retained \$7,817.93. Sixty-five (65) businesses were permitted to market alligator products; generating \$2,275.00 in state revenue. Fourteen (14) night spotlight surveys were conducted on sample areas to provide an index of the alligator population. The 1995 Private Lands Harvest Program was implemented. A total of 210 tags were issued and 127 alligators were harvested from 11 properties. Over 800 feet of hides and more than 1 ton of alligator meat was produced during the season. The program generated \$7,130 in state revenue.

The second year of a long-term research project examining temperature-dependent sex determination in alligator hatchlings was completed. A paper entitled "SEX RATIOS OF NATURALLY-INCUBATED ALLIGATOR HATCHLINGS: FIELD TECHNIQUES AND INITIAL RESULTS" was completed by the project supervisor and presented at the 49th Southeastern Association of Fish and Wildlife Conference in Nashville, TN. A paper entitled "GROWTH RATES OF AMERICAN ALLIGATORS IN COASTAL SOUTH CAROLINA" was completed by the project supervisor and has been accepted for publication in the JOURNAL OF WILDLIFE MANAGEMENT. Lastly, a book chapter titled "THE HEALTH OF ALLIGATOR POPULATIONS IN SOUTH CAROLINA" is in the editorial stage. The chapter will be in a book entitled "PRINCIPLES AND PROCESSES FOR EVALUATING ENDOCRINE DISRUPTION IN WILDLIFE."

Small Game Project

Regional wildlife biologists were assisted with small game habitat development on Wildlife Management Area (WMA) lands. Ongoing projects at Webb Wildlife Center (5,800 acres), Fant's Grove WMA (8,000 acres) Crackerneck WMA (4,700 acres), Santee Cooper WMA (2,800 acres), Sand Hills State Forest WMA (46,000 acres), Manchester State Forest WMA (29,000 acres), Canal WMA, U.S. Forest Service lands in Union County, McBee WMA (780 acres), and on U.S. Army Corps of Engineers land (1,200 acres) were continued. A new project was initiated on Fort Jackson in cooperation with the U.S. Army and Quail Unlimited.

The S.C. Forestry Commission and the S.C. Department of Parks, Recreation and Tourism continue to be assisted with development of a multi-purpose dog-trailing and recreation area on Sand Hills State Forest. The H. Cooper Black, Jr. Memorial Field Trial and Recreation Area encompasses approximately 7,500 acres and will serve the needs of many S.C. citizens.

The South Carolina Forestry Commission was contracted to grow shrub lespedeza seedlings, which are then provided to the public. One million seedlings were available for distribution, with 928,000 being sold to the general public and the remainder utilized on WMA lands.

Seventy public and private shooting preserve operations were licensed. Revenue received from license fees was \$55,700. Four preserves and commercial quail breeders were inspected and/or provided with technical assistance.

Two overnight seminars on bobwhite quail management were conducted, attended by 64 landowners or managers controlling considerable acreage of potential quail habitat.

Twenty-five counties participated in the 4-H Food and Cover Establishment (F.A.C.E.) for Wildlife Program, with 82 food plots entered in the contest. Thirty-four counties were enrolled in the F.A.C.E. Program for the coming year.

An annual survey of hunting success by rabbit hunters was conducted for the 5th consecutive year, and a summer Quail Brood Survey was conducted in conjunction with the Wild Turkey Brood Survey for the 3rd year. The U.S. Fish and Wildlife Service S.C. Cooperative Research Unit was assisted with continuation of a mourning dove research project in Marlboro and Orangeburg Counties. Project staff directly assisted with banding of over 300 doves on the Marlboro County study sites. A research project to evaluate possible effects of deer browsing on bobwhite quail food plants at Webb Wildlife Center continued for the 4th year.

Twelve Quail Unlimited (QU) meetings and fund raisers were attended and cooperative projects for habitat improvement and education developed. Joint SCDNR-QU projects involved \$19,382 QU dollars.

The project supervisor served on the State Conservation Review Group of the USDA Farm Service Agency, and the State Technical Committee of the Natural Resources Conservation Service, which are responsible for reviewing and recommending changes in regulations governing various federal agricultural programs such as the Conservation Reserve Program (CRP), Agricultural Conservation Program (ACP), Acreage Conservation Reserve (ACR) and the Wetland Reserve Program (WRP). Each of these incentive programs has potential beneficial as well as detrimental impacts on wildlife. The project supervisor also represented the department on the Southeastern Association of Fish and Wildlife Agencies Dove Technical Committee and Farm Wildlife Committee, the South Carolina State Committee of Quail Unlimited, the South Carolina Commission on Sporting Dogs and Field Trials Advisory Committee, the South Carolina Prescribed Fire Task Force, as well as serving as Chairman of the Southeastern Section of The Wildlife Society Farm Wildlife Committee. Project staff also participated in several workshops to develop recommendations for the 1996 Farm Bill.

Project staff coordinated the 1st annual meeting of the Southeast Quail Study Group (SEQSG), an organization of over 70 professional quail biologists, managers and researchers from 17 states. This inaugural meeting was hosted by SCDNR at the Webb Wildlife Center in Hampton County. The project supervisor serves as chairman of the Steering Committee for the SEQSG.

One hundred fifty-seven small game field trial permits, 1 depredation permit and 29 quail recall pen and quail translocation permits were issued. Also, 18 bird dog training licenses were issued and 5 rabbit enclosures approved.

Waterfowl and Wetlands Management Projects

A total of 21,127 wetland acres on these Department owned and managed Project properties were intensively managed utilizing state-of-the-science techniques to provide quality production and wintering habitat for local and migratory waterfowl as well as a wide variety of other wetland dependent wildlife species. These tracts represent approximately 29.7% of the total managed tidal wetlands in South Carolina.

The annual midwinter index for South Carolina was coordinated; trend estimates from this survey indicated a total concentration of 190,239 ducks (+42.0% from 1995) were observed in South Carolina in 1996; the 1996 midwinter estimate of ducks was +24.2% from the 10-year average, 1987-96. The 1996 survey represented 9.2% of the estimated Atlantic Flyway population of ducks (+70.4% from 1995). An estimated 6.5% of the Atlantic Flyway dabbling ducks were enumerated in South Carolina (-59.1% from 1995); the number of dabbling ducks was -10.3% from the 10-year average, 1987-96.

Project personnel represented South Carolina on the Atlantic Waterfowl Council Technical Committee and actively served on various constituent committees including the harvest management, wood duck and mallard committees. The waterfowl project leader serves on the International ad hoc committees to evaluate the Flyway Council System and evaluate the regulatory process.

A \$400,000 grant under the North American Wetlands Conservation Act was utilized to acquire and enhance 328 acres of prime coastal wetlands adjacent to Samworth WMA. All focus area initiatives are components of the Atlantic Coast Joint Venture of the North American Waterfowl Management Plan.

Samworth and Santee-Delta Wildlife Management Areas

Through water level manipulation, a total of 2,101 acres on these areas were managed intensively to produce annual crops of naturally occurring, seed producing, herbaceous plants favored as food sources by waterfowl.

Additional project activities included office and building coordination for Wildlife Region VI, Wildlife Diversity Upper Coastal Plains Project; additionally, more than 3,000 citizens visited Samworth WMA requesting information from one of the several projects or with historical interests.

Total public use on these projects was estimated to have exceeded 7,500 man days during 1995-96.

Statewide Wood Duck Nest Box Project

A total of 249 applications from prospective cooperators were received and evaluated for inclusion into this project. During 1995-96, approximately 1,500 nest boxes were constructed and 1,460 nest box units were distributed to 228 new cooperating landowners. Through the 15th year of this project, 2,858 cooperators have received 21,260 nest box units and approximately 1,210 units have been allocated to agency projects.

Data analysis from the 1995 nesting season included responses from 37.9% of the project cooperators reporting a minimum estimated production of approximately 34,277 ducklings.

Forest Stewardship Program

The purpose of the Forest Stewardship Program is to assist and encourage non-industrial private landowners in actively managing natural resources on their property. The South Carolina Forestry Commission administers the program and other natural resource management agencies, such as South Carolina Department of Natural Resources and U.S.D.A. Natural Resources Conservation Service, provide input in their particular area of expertise.

During fiscal year 1996, wildlife management section personnel reviewed 27 plans, visited 149 sites, were principal authors/coauthors on 82 plans, conducted 63 needs checks and 68 compliance checks for a total of 253.51 person days.

The stewardship biologist also serves on committees such as: Forest Stewardship Incentive Program Funding Committee for the Camden, Sumter, Lexington, Orangeburg and Walterboro Areas; Forest Stewardship Coordinating Committee's SIP Policy and Procedure Subcommittee; South Carolina Red-Cockaded Woodpecker Conservation Coalition; South Carolina Tree Farm Committee and Clemson University Alumni Association (Forestry). Programs on forest stewardship, forestry, wildlife and the Outdoors-Woman Program were presented to approximately 750 participants during the past year. The stewardship biologist presented a paper, *Beaver Impacts on Timber in the Chauga River Drainage in South Carolina*, to the 7th Eastern Wildlife Damage Control Conference, in Jackson, MS on November 8, 1995.

FRESHWATER FISHERIES SECTION

The Freshwater Fisheries Section is organized, equipped and staffed to provide the sportsmen and citizens of South Carolina with those services required to protect, conserve, and enhance the state's freshwater fishery resources.

The Fisheries Section's organizational structure includes eight fishery districts that provide local attention to every county in the state. Operations incorporate six fish hatcheries that are used to produce and stock those species necessary to replenish and enhance natural fish populations. Additionally the agency provides fifteen public fishing impoundments across the state totaling 1,385 acres water.

District Operations

Survey and inventory activities were conducted to assess the status of fish populations in 32 lakes and reservoirs and in 18 rivers and streams. A summary of these activities is presented in Table 1. In cooperation with the Law Enforcement and Boating Division trout stocking of the Lower Saluda River by helicopter was continued.

A summary of technical assistance activities is presented in Table 2. Activities relating to fish habitat development and angler access improvements are summarized in Table 3.

Table 1. Sampling techniques by water body, FY96.

	Sampling Technique											
LAKES AND RESERVOIRS	Rotenone	Electrofishing	Gill nets	Trap nets	Hoop nets	Creel Survey	Trawl or meter net	Seine	Water Quality	Hook & Line	Macro-invertebrates	other (specify)
Broadway Lake		X										
Dargon's Pond		X										
Fishing Creek Reservoir		X										
Four Holes Swamp												
Jonesville Reservoir		X										
Lake Blalock		X										
Lake Bowen		X										
Lake Brown		X				X						
Lake Cherokee		X										
Lake Greenwood		X		X								
Lake Hartwell		X	X	X								
Lake Jocassee		X	X			X			X			
Lake Johnson								X				
Lake Keowee		X				X			X			
Lake Long		X										
Lake Marion			X	X				X		X		(a)
Lake Monticello	X	X		X								
Lake Moultrie			X							X		
Lake Murray	X	X		X					X			
Lake Oak Grove								X				
con't	Rotenone	Electrofishing	Gill nets	Trap nets	Hoop nets	Creel Survey	Trawl or meter net	Seine	Water Quality	Hook & Line	Macro-invertebrates	other (specify)

[illegible]

Cooper River		X										
East Fork Chatooga		X										
Eastatoe River		X										
Edisto River		X				X (e)						(b)
Great Pee Dee River		X			X	X			X			(f)
Little River (M'Cormick)		X				X						
Long Cane Creek		X				X						
Matthews Creek		X										
Middle Saluda River		X										
Saluda River		X				X			X		X	(g)
Santee River		X	X			X						
Savannah River		X										
Tom's Creek	X	X							X			
Tributaries of the Broad River in Richland and Kershaw Counties	X								X			
Tributaries to the Savannah River in Anderson County		X							X		X	
White Water River		X				X						

(a) mesocosms for STB fry growth; (b) STB tagging; (c) substrate analysis and physical parameters; (d) radio telemetry for trout movement; (e) targets Spring RBS fishery; (f) tagging study; (g) aquatic macrophyte survey

Table 2. Technical assistance activities by area, FY96.

	Pond Management								Environmental Permits	Fish Kill Investigations	
	Pond Balance Checks	General Pond Management (fertilization, etc)	Aquatic Vegetation Control	Pond Stocking	Parasites and Diseases	Other	Total Number of Ponds Checked	Total Acreage Checked	Total Number of Permits Reviewed	Number of Public Water Fish Kills	Number of Private Water Fish Kills
District I	29	103	64	20	4	7	35	602	0	4	4
District II	36	41	11	0	1	0	63	174	0	0	2
District III	19	36	20	0	4	20	36	119	5	3	3
District IV	88	75	84	15	4	99	154	534	2	1	6
District V	94	136	164	66	10	23	493	500	0	2	6
District VI	28	5	44	20	10	20	77	939	5	0	4
District VII	7	24	53	0	4	12	110	341	7	1	23
District VIII	68	62	122	0	2	0	137	480	0	1	6
Eastover	0	100	1	0	0	0	39	65	0	1	0
TOTAL	396	582	563	121	39	181	1,144	3,754	19	13	54

Table 3. Report of development activities by activity type and area, FY96

	Fish Habitat Development				Angler Access Improvements				
	Fish Concentration Areas		Instream structures		Angler Access Trails		Fish Feeders		Angler Mooring Areas
	Number of fish attractors maintained	Acre-feet of habitat created	Number of structures maintained	Feet of stream habitat improved	Miles of trails maintained		Number of feeders maintained	Pounds of feed used	Number of devices installed
					Boating	Foot			
District I	28	2.0	30	400	0	0	4	150	0
District II	35	0.6	0	0	0	1.0	0	0	20
District III	42	0.5	0	0	0	0.2	0	0	0
District IV	51	2.0	0	0	0	4.0	3	5,000	0
District V	4	0.5	0	0	0	0	1	1,000	0
District VI	0	0.1	0	0	15	0	0	0	0
District VII	0	0	0	0	0	0	2	800	0
District VIII	0	0	0	0	0	0	0	0	0
TOTAL	160	5.7	30	400	15	5.2	10	6,950	20

Table 4. Striped bass and hybrid stocking records for FY96.

Stocking Location	Species	Number Stocked
Lake Thurmond	Hybrid (original)	462,022
Lake Hartwell	Hybrid (original)	294,362
Lake Moultrie	Striped Bass	3,600,000
Lake Murray	Striped Bass	1,159,970
Lake Wateree	Striped Bass	205,000
Lake Secession	Striped Bass	8,000
Catawba River	Striped Bass	62,600
Lynches River	Striped Bass	46,000
Cooper River	Striped Bass	1,196,744

Fish Hatcheries

Sterile Grass Carp Program: During FY96 218,095 sterile grass carp were shipped into South Carolina for stocking in public and private waters. Ploidy was tested on 3,830 individuals. On two occasions diploid grass carp were detected and those respective shipments were rejected and returned to the vendor.

Fish Hatchery Operations and Production: The Department's seven freshwater hatcheries produced a total of 13,134,138 fish during FY96. Of this total 1,314,400 were rainbow and brown trout produced at the Walhalla Trout Hatchery in Oconee County which came under state operation in January, 1996. Hybrid and striped bass stocking records are presented in Table 4.

State Lakes Maintenance

The Freshwater Fisheries Section manages and maintains fifteen public fishing lakes. Maintenance of these facilities includes construction and repair of support facilities, boating access, aquatic weed control, lake fertilization, and maintenance of grounds and signage.

Major repairs were completed on the spillway system in the 278 acre public fishing portion of Lake Wallace.

Rediversion Project

The Rediversion Project is funded by the U. S. Army Corp of Engineers. The efforts of the project are directed toward mitigating the impacts of the Cooper River Rediversion Project on anadromous fish populations in the Santee-Cooper system.

Approximately 1,957,700 fish were passed at the St. Stephen's fish lift and an additional 117,000 pounds of fish (390,000 herring units) were passed in to the system at the Pinopolis lock. During the fish lift season the St. Stephen's facility was toured by over 3,400 visitors. Agency personnel continued to work with USACOE staff to complete a \$5.8 million modification to improve lift efficiency and effectiveness. Work was initiated to evaluate the shortnose sturgeon population that utilizes the rediversion canal and fish lift.

Wateree-Congaree Research Station - Eastover

Genetic evaluations of trophy largemouth bass (>7 lbs.) from lakes Murray and Moultrie were continued. First year growth in two strains of largemouth bass stocked in Piedmont and Coastal Plain was analyzed. Pond water quality was monitored. Genetic analysis of fingerlings is underway to assess shifts in allele frequency for each pond population relative to initial frequencies. Genetic evaluation of striped bass populations in the Great Pee Dee and Santee rivers and in the ACE basin continued.

Redeye bass were collected from the Chattooga, Chauga and Saluda rivers, Stevens and Generostee creeks and Lake Jocassee. Collection sites encompassed the statewide geographic distribution of this native species. Age and growth, age at maturity, and fecundity estimates were obtained. Allozyme analysis is under way to determine the level of genetic divergence among populations.

Larval striped bass survival and growth rates were measured from groups of larvae stocked into a series of mesocosms stationed in the head waters of Lake Marion. The mesocosms were managed to simulate various levels of productivity. These data will be used to fine tune the individual-based model for striped bass of the Santee-Cooper system.

Assistance was provided to Fishery Districts I, II, III, and VI in age and growth evaluations of brook trout and flathead catfish.

WILDLIFE DIVERSITY SECTION

The mission of the Wildlife Diversity Section is to maintain all of South Carolina's native plants and animals in their natural habitats and preserve the archaeological record on the land. As reported below, this mission is accomplished through the major program areas of Research and Survey, Recovery, Habitat Protection, Data Services, Information and Education, Wildlife Assistance, and Management and Technical Guidance.

RESEARCH AND SURVEY

Bat Population Survey, Leesburg Training Site, Fort Jackson. With financial support from the SC National Guard, extensive surveys were made to locate species of concern and develop management recommendations. Techniques included ultrasonic detection with special audio equipment and signal analysis software using a laptop computer. Six bat species have been documented at the site, reports were submitted for the first two years of the project, and a presentation was made to the Environmental Committee at the site.

Big-Eared Bat Study, in the Mountains and Piedmont. Likely sites were surveyed at night using special traps, and winter counts were made at 39 different tunnels, mines, and rock houses. Although four species of bats were documented, no big-eared bats were found. Four of the 39 sites held big-eared bats in previous years. In connection with overall small mammal surveys, three blood samples were submitted to the Center for Disease Control in Atlanta, Ga. to support an ongoing Hanta Virus Survey.

Piedmont Vertebrate Survey. Small mammals, reptiles and amphibians were surveyed at Landsford Canal State Park and the Ann Springs Close Greenway. Several range extensions or uncommon species were noted. Data are being contributed to the Museum of York County, and the Museum is also planning to expand its surveys in corporation with the DNR.

Duke Power Company Hydroelectric Plant Surveys. In cooperation with the DNR, Duke hydro plant operators are recording information on vertebrate species occurring in the vicinity of their plants. This effort is providing data at additional sample points at no cost to the DNR.

Duke Power Company Land Survey. A survey of company-owned lands along the Catawba River was initiated in order to locate significant wildlife and natural areas worthy of protection. The survey will concentrate on wetlands with high intrinsic wetland values and areas having an abundance of wildlife, especially herons, egrets, ospreys, cormorants, and bald eagles.

Migratory Bird Surveys at Heritage Preserves. Breeding season surveys were carried out at the Waccamaw and Little Pee Dee River Heritage Preserves in order to document bird utilizations at the preserves and establish a baseline and reference points for future surveys. Seven neotropical migratory bird species were documented, all of which are considered to be tree canopy or overstory species. Very few low shrub or ground-nesting species were noted, although they are common on nearby Carolina Bay preserves which provide thick understory habitat. Hence, the Carolina Bay and the bottomland hardwood preserves in the Pee Dee Region complement each other in

terms of bird habitat structure.

Monitoring Avian Productivity and Survival (MAPS) at Congaree Swamp National Monument. As part of this nationwide, constant-effort survey program to determine causes of declines in neotropical migratory songbird species, banding was continued at designated sites in the Monument. Results were submitted to the National Study coordinations for storage and analysis. The project will continue in future years until a significant store of data is on hand.

Shorebird Surveys. In 1995, surveys were completed for all nesting seabirds, gulls, terns, and skimmers. Nest counts totaled 18,863 (Table I) which represented a precipitous decline since 1993 (-33%). Species that were down in South Carolina in 1995 were royal tern, -52%; sandwich tern, -36%; gull-billed tern, -40%; laughing gull, -34%; and eastern brown pelican, -27%. Losses of all species except Sandwich Terns were compensated by gains in Georgia and North Carolina.

Piping Plover Survey. Winter surveys continued for this critically endangered species, whose Atlantic breeding population is believed to follow a narrow strip along the Atlantic coast during spring and fall migrations. Deveau Bank, located near the mouth of the North Edisto River is still the most important Piping Plover wintering area in South Carolina. A new location at the north end of Kiawah Island was the second most important site. Other important sites were Huntington Beach, Cape Island and Harbor Island.

Bald Eagle Monitoring. Bald Eagle nesting activity was monitored during ten aerial surveys. A total of 134 eaglets were produced from 105 occupied territories. These numbers represent continued high productivity. Eleven banded adult eagles were checked for the continued presence of leg bands at nesting sites to document rates of adult mortality. Overall, adult mortality rates have remained higher than expected, averaging 14 percent per year.

One eagle nest was found in a pine off the shore of Lake Russell. Adult eagles were seen but no immatures or chicks were found. The SC portion of the national mid-winter Bald Eagle survey also documented 346 Bald Eagles.

Manatee Survey and Monitoring. A total of 209 manatees have been reported during the past four years, compared to 23 manatees reported in the previous 100 years. This increase could be the result of improved reporting, increased activity in SC waters, or both. Most reports are received during July and August and are concentrated in the Hilton Head and Charleston Harbor areas. "Chessie", a radio instrumented manatee, traveled through South Carolina for the third consecutive year.

Sea Turtle Research and surveys. Six Aerial Beach Surveys for nesting Loggerhead Turtles resulted in an estimate of 3,733 nests which represents 910 nesting females. These numbers fall within annual variation observed previously. Research originated elsewhere to test loggerhead turtles' magnetic orientation ability was carried out in SC waters for a two-week period. Results so far are inconclusive.

Four Pelagic Aerial Surveys for Leatherback Turtles were conducted to document the distribution of leatherback turtles during their spring migration. These surveys are part of a Federal Contingency Plan with Georgia and Florida. Fewer leatherbacks were seen here and in Georgia and Florida this spring, and the major part of the migration may have been farther offshore for unknown reasons. Despite the low number of leatherbacks in coastal waters this spring, one nested here on 14 June on St. Phillips Island, the first documented nesting of this species in South Carolina.

Colonial Wading Bird Survey & Census. A statewide survey and census of wading bird nesting populations revealed that the overall wading bird nesting population increased significantly over our previous survey in 1994, primarily as a result of an increase in White Ibis nesting. Both Wood Storks and Double-crested Cormorants also continued to increase their range and nesting population in 1996. Other species totals were variable but stable over the past 8 years. Overall,

we are cautiously optimistic concerning the health of South Carolina's wading bird populations. Special related were surveys carried out to develop management recommendations under the Charleston Harbor Project and to provide site-specific data under the Foraging Habitat Survey-Bear Island WMA

Wood Stork Survey. Wood Storks first nested in South Carolina in 1981, and surveys have been initiated to monitor the State's contribution to the recovery of this endangered species. Surveys show that nesting sites here are generally associated with fresh and brackish feeding habitats. Overall, Wood Storks continue to expand their range and nesting population and contribute significantly to the recovery of the regional nesting population.

Least Tern Survey. Ongoing surveys of this beach-nesting species of concern indicate a slight increase in colonies over 1995 (47 vs. 38). However, the proportion of colonies on building rooftops was similar between 1995 and 1996 surveys. In 1995, 59% of colonies were on rooftops as compared with 52% in 1996.

Longleaf Pine Project

In the Sandhills belt floristic work at Fort Jackson, Mulberry Plantation (in Richland County), Sandhills State Forest and Four Hole Swamp resulted in the discovery of new populations of the following species: Two populations of Calamovilfa brevipilis (pine barrens reed grass), 2 populations of Sporobolus sp. nov. (an undescribed dropseed), 5 populations of Lobelia batsonii (a sandhill endemic), Aster sp.? (species undetermined, sandhill endemic), and 1 population of Hexastylis sp.? (species undetermined, sandhill endemic = pocosin heartleaf). After four years of intense museum and field work, these species appear to be very localized on or near major public properties. Steps are being initiated for their recognition and protection.

Additional survey work was conducted for the Carolina Pygmy Sunfish, another sandhill endemic. Over 35 different streams were sampled and with only one confirmed sighting, at the type locality for the species. Physical, chemical and biological measurements were also made in order to describe the characteristics of high quality streams in this region of the state.

Although no gopher frogs or flatwoods salamanders were encountered during survey efforts, two reports of adult flatwoods salamanders were confirmed from other researchers. The lack of gopher frog breeding in 1996 is likely an indication of unfavorable conditions. On the other hand, no breeding has been documented for the flatwoods salamander in the last 6 years. Hence one possible conclusion is that adult populations have declined to the point where they are not sustainable.

In 40 man-days of pine snake-southern hognose snake-mimic glass lizard surveys, 5 pine snake records, 2 southern hognose snake records and no mimic glass lizard records have been collected through this survey. A small grant was awarded to Dr. Jeff Camper, Francis Marion University, to initiate a study of reptiles and amphibians at the Sandhills National Wildlife Refuge. Thirty-seven species of reptile and amphibian have been documented by this study, including one record pine snake.

A graduate student at the University of Georgia is sampling vegetation at the preserve to determine the impact the gopher tortoise on the community. She is trapping tortoises, taking morphometric and reproductive data, then marking and releasing the animals. This study is ongoing with a target completion date of September 30, 1996.

A contract was awarded to survey the Coastal Plain for occurrences of the Atlantic White Cedar Swamps. Over 140 individual Cedar Swamp locations were recorded during this survey. The majority, over 90%, of these were less than 5 acres in size and were associated with impounded streams. High quality examples were very uncommon. As a result of this study the best White Cedar Swamp in South Carolina has been approved as a protection project by the Heritage Trust Advisory Board.

The Eastern diamondback rattlesnake is listed as a species of concern in South Carolina and

is considered by most experts to be declining rangewide. In South Carolina the diamondback is under pressure from habitat loss, collecting, and incidental killing. Much of the effort for the rattlesnake survey, over 20 man-days, was donated, volunteer time. Twelve eastern diamondback rattlesnakes were collected, morphometric data taken, marked using PIT tags and released.

The survey of amphibians and reptiles of the Palachucola WMA continued during 1996 and to date 47 species have been documented for this area.

Other Botanical Surveys. In the mountains, Solidago simulans, the granite dome goldenrod was documented for Caesar's Head State Park. This rare species is endemic to the extreme southern Appalachians. Trail reconstruction will protect this and other sensitive species here. A new Mountain Sweet Pitcher plant (Sarracenia jonesii) population was located in the upstate. It one of only 14 known sites for this federally endangered species.

Six technical publications were prepared in conjunction with this work.

RECOVERY

Red-cockaded Woodpecker. Major activities concentrated on building up the nesting population at Sand Hills State Forest. Nest initiations were up in 1996, although overall reproduction was down this year and was attributed to increased predation on hatchlings and fledglings during their first week. There were 38 nest attempts, an increase 4(12%) over 1995 and 11(40%) over 2 years. Twenty-two nests were in artificial cavities in 1996. Five juvenile females to were translocated to single male sites; two were successful.

Supporting the Red-cockaded Woodpecker Conservation Coalition, which has developed strategies to help ease private land-RCW conflicts was also a major activity. The Coalition is close to finalizing plans for a statewide "Habitat Conservation Plan" (HCP), which includes a "Safe Harbor" provision.

Technical assistance to landowners/foresters involving timber sales that could have affected RCWs was down in 1996, most likely due to low saw timber prices in South Carolina. We provided technical guidance in 10 instances where timber sales may have affected Red-cockaded Woodpeckers.

Loggerhead Turtle. The 40-member volunteer South Carolina Sea Turtle Stranding and Salvage Network continues to provide valuable data on the temporal and spatial distribution of sea turtle carcasses that wash ashore. Sixty-five were documented for the latter half of the 1995 season for a total of 133. Ninety-two have stranded during the first half of the 1996 season. In both years under the Emergency Response Plan of the National Marine Fisheries Service (NMFS), the previous week's stranding totals were faxed each Monday to the Miami Fisheries Center.

A beach management workshop was held at Ft Johnson Marine Resources Center for the leaders of the 16 volunteer nest protection projects. *Loggerheadlines*, the stranding network newsletter is produced five times each season. Eleven monthly aerial surveys were also conducted along the coast to find dead sea turtles and marine mammals on remote islands.

The U.S. Army Corps of Engineers in consultation with the National Marine Fisheries Service was prepared to expand their "dredging window" into the months of November in the fall and April and May in the spring. After meeting with a Georgia and South Carolina DNR sea turtle biologists, they agreed not to issue contracts that included these months.

Staff also served on the sea turtle Expert Working Group. This 12-member panel, mandated by Congress and appointed by NMFS, was charged with determining an incidental take level for fisheries related mortality that would not cause the extinction of Kemp's ridley or prevent the recovery of loggerhead turtles.

Peregrine Falcon: We checked the eyrie at Table Rock twice this May. The pair raised three young this spring. This is the seventh consecutive year that the falcons had a successful nest at Table Rock, Pickens County.

HABITAT PROTECTION

Thirteen different properties totaling 7,198 acres were acquired. Seven of the properties form new preserves and six of the properties are additions to existing preserves. A total of \$2,403,993 was spent on property acquisitions for an average total cost of \$334 per acre. Donated property was valued at \$3,815,756. The Nature Conservancy assisted us in four separate property acquisitions and three properties were received as outright donations. These efforts served to protect three rare animal species, 47 rare plant species, 23 rare plant communities, one important archaeological site and one wading bird rookery. A total of \$224,957 was spent on capital improvements, contracts and preserve management activities. Revenues to the Heritage Land Trust Fund totaled \$2,034,842 and expenditures totaled \$2,628,950.

FY 95-96 ACQUISITIONS AND EXPENDITURES

	Acres	Date Acquired	Total Cost
1. Dungannon HP	643	7-3-95	\$527,852
2. Rock Hill Blackjacks HP Addition	75	8-30-95	6,316
3. Aiken Gopher Tortoise HP	366	8-31-95	213,491
4. Buzzard Roost HP Addition - Rader	216	9-13-95	121,597
5. Gopher Branch HP	11	9-15-95	19,587
6. South Williman Island HP	2,765	10-20-95	0
7. Segars HP Addition	182	12-30-95	2,143
8. Brasstown Creek HP	461	1-4-96	482,576
9. Dargan HP Addition- Upper Gunter's Island	1,986	2-23-96	881,567
10. Old Island HP	400	5-22-96	0
11. Rock Hill Blackjacks Addition - Marshall	93	6-21-96	148,864
TOTALS	7,198		\$2,403,993

PRESERVE MANAGEMENT

Twelve volunteer stewardship workdays were held on upstate Heritage Preserves. These workdays included clearing trees from an earthen dam, construction of water bars and turn outs, erecting a fence to prevent trampling of endangered plants, blocking closed roads, pine beetle control, control of exotic plants, trash clean ups, and trail maintenance.

In cooperation with several institutions, a native dove field was planted on Bunched Arrowhead Heritage Preserve. This experimental dove field is part of a Master's student project. A total count of the swamp pink (*Helonias bullata*) population, at the Watson Heritage Preserve this spring, marked the seventh year of monitoring. The total number of plants has remained essentially

the same for the past six years. Swamp pink is listed as threatened at the federal level.

All of the *Sarracenia jonesii* populations on the Chandler and one on the Ashmore Heritage Preserve were visited. Two botanists from the Atlanta Botanical Gardens assessed the sites.

A stewardship committee organizational meeting was held at Blackjack Oaks Heritage Preserve. Site preparation for restoring (*Helianthus schweinitzii*), a federally listed endangered sunflower was also carried out under a mitigation agreement negotiated with AMP, Inc. for wetlands impacts occurring at a nearby site.

A stewardship work day was held at 40 Acre Rock Heritage Preserve. Although there are still problems with the littering, spray-painting on the rock, and damage to the pools from illegal vehicle access, the preserve is in much improved condition than before SCDNR acquired it.

We conducted prescribed burns on Tillman HP, Cartwheel Bay HP, and Aiken Gopher Tortoise HP and assisted The Nature Conservancy in burning Peachtree Rock Preserve. Fire lines were plowed on Lynchburg Savannah Heritage Preserve, but a fire escaped on to the preserve from an adjoining property. The burned area responded very well and a great variety of plants including several insectivorous plants thrive there.

We began re-marking boundary lines on our preserves, some of which were becoming obscure.

We completed Phase I of wetland restoration work on Windmill High Pond Heritage Preserve.

A draft of the Waccamaw River HP Management Plan was completed, and a public meeting was scheduled to review the plan.

DATA SERVICES

Approximately 550 requests for data from the Heritage database of rare or threatened species and communities were serviced this year. Most requests come from environmental consultants, other government agencies, and cooperating organizations such as the Nature Conservancy, the Sierra Club, and the Wilderness Society also submit requests. Some data request highlights:

(1) for South Carolina Electric and Gas - occurrence data, by quad, for the entire SCE&G coverage area (approximately the lower two-thirds of the state)

(2) for Duke Power - occurrence data and maps for Crescent Timber lands (vicinity of Lake Jocassee, Oconee/Pickens County)

(3) for Santee Cooper - occurrence data and maps for various sites in Orangeburg County and vicinity

Approximately 500 permits were also reviewed.

Approximately 950 element occurrence records (EORs) have been added to the BCD database (total EORs = ~7000). This data has come primarily from:

(1) Survey of eagle and wading bird nesting, by Tom Murphy & staff

(2) Survey of the coastal plain, by Richard Porcher

(3) Survey of the Sandhills State Forest, by Gerald Long

(4) Review of The Citadel herbarium records, compiled by Richard Porcher

INFORMATION AND EDUCATION

Over 50 slide shows presentations were given to civic or conservation groups on a variety of subjects. Other activities and programs included:

Bird-banding demonstrations as part of International Migratory Bird Day (a cooperative effort with the SC Wildlife Federation and Sandhills Research and Education Center)

A teachers workshop at the Webb Wildlife Center (sponsored by The Wildlife Society)

In cooperation with the Cape Romain National Wildlife Refuge, 10 hatchling loggerhead turtles were provided to Riverbanks Zoological Park for display. The zoo returned one year old turtles from the previous year for release in the Gulf Stream from a U.S. Coast Guard helicopter.

An office and laboratory established at the Webb Wildlife Center in 1995. Work to renovate this building has continued this year and the building and grounds now support a small collection of native reptiles and amphibians and a small pond, planted with native wetland species. This

facility has been used for tour groups, including school groups, Scouting groups and a Teachers Workshop, as an interpretive center for amphibian and reptile ecology.

WILDLIFE ASSISTANCE

Over 3,900 individual requests for assistance or information concerning injured or nuisance wildlife were received, and 80 individual permits for taking and possession of wildlife were processed. Major activities intended to reduce or respond to special problems included the following:

A workshop was held in Columbia in September concerning nuisance wildlife. From this workshop, a network of Nuisance Animal Damage Control Operators was formulated.

With the help of Charleston County Animal Control, Charleston County Communications Supervisor, procedures were documented on handling wildlife problems and emergencies for municipalities and Charleston County area. This management tool has reduced duplication of effort and allowed for quicker response to calls. It was agreed that nuisance calls concerning raccoons, etc would be turned over to the Nuisance Animal Damage Control Network. This document has greatly cut down on the number of calls requiring department assistance.

A total of four eagles were handled at rehabilitation facilities. Three eagles were released and one is still recovering. Three eagles were found dead this year.

Middleton Gardens was visited several times to determine what was causing the damage to 200 year- old camellias. The cause was determined to be migratory sapsuckers and deer.

Alumax requested aid in discouraging purple martins from roosting on overhead rails and tanks. After reviewing the area, silver balloons and netting were recommended. Lights were already being used to illuminate the area and deter the birds. Between 2000-4000 birds were arriving at dusk and leaving aerial walks unsafe. The walks were some 1700 feet above ground.

Two oil bird workshops were held with 190 people in attendance at each. Hands on washing of oiled birds was part of the program. These workshops were hosted by the USFWS and SCDNR. In February, the Charleston 96 NPREP Oil Spill Drill was also held. This meeting consisted of pre-drill meetings, the fake spill, with artificial wildlife picked up, and a summary meeting the next day. The drill was coordinated by the National Strike Force. Participants were the US Coast Guard, DHEC, Emergency preparedness from Washington, DC, the USFWS and the DNR.

A presentation, "Control of Bats," at the Southeastern Nuisance Wildlife Management Short Course in Columbia. The Bat Exclusion Referral List of Pest / Animal Control Operators was updated, as it has been every year since it was developed in 1992. Identification of bats sent to the South Carolina Department of Health and Environmental Control for rabies testing also continued. Training of some DHEC staff in bat identification continues as more bats and species are received.

The 38-member volunteer Marine Mammal Stranding Network consists of private citizens trained to gather data on dead stranded animals. Department personnel and veterinarians provide assistance to live stranded animals. During the latter half of 1995, there were 17 strandings with a total of 40 for the year, including 32 bottlenose dolphins. *Marine Mammal Matters*, the newsletter for the network, is produced twice a year.

WILDLIFE MANAGEMENT & TECHNICAL GUIDANCE

The second Annual Bottlenose Dolphin Count was held in 1995 and was coordinated by SC DNR and Coastal Carolina University as part of a region-wide effort from New Jersey to Georgia. Over 200 persons participated in South Carolina and counted 202 dolphins. Teams of counters were placed along the beaches at three mile intervals and documented dolphins that passed in front of them from. These counts are not intended to be a complete census of the population but will give us some relative numbers that can be compared from year to year.

Correspondence with landowners regarding Bald Eagle Nest Site Management involved numerous calls and over 100 year end reports. Approximately 100 ground visits were made

during the nesting season to give technical advise on habitat management, to verify new territories, to evaluate permit reviews and to supplement our aerial monitoring efforts.

Consultations with SCE&G and USFWS continued in order to develop a habitat conservation plan designed to minimize collision and electrocution injuries to eagles and other birds. Work on a video to teach raptor identification and handling techniques was begun. This video will be used to train SCE&G linemen and will be adapted for use by SCDNR employees.

Staff biologists provided technical guidance on the improvement of wading bird nesting and feeding habitats for 4 landowners.

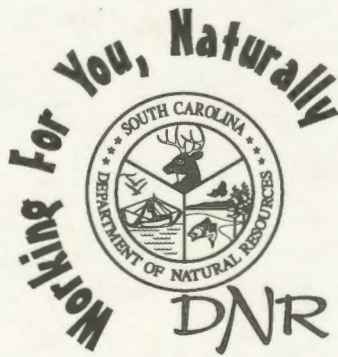
A staff biologist served as state coordinator for Partners in Flight, a national and international partnership of state and federal government agencies, non-profit organizations, and private industry promoting the conservation of migratory birds, as well state coordinator for the Breeding Bird Atlas Project, a statewide effort to map the distribution of breeding birds.

Technical advice was provided to the Richland County Byways Task Force, formed to provide direction to the Planning Commission for highway beautification.

Staff supported the first W.A.I.T. (Wildlife And Industry Together) meeting FOR Upstate industries. The focus of the group is to provide a means for industry land managers to access wildlife personnel and information for developing wildlife habitat on their properties.

Technical assistance about wildlife management was provided to the Anne Springs Close Greenway near Fort Mill. Several field trips were made to the Greenway to advise the ranger concerning management techniques. Assistance was also provided to the DNR concerning management of WMA near Brattonsville for creating a prairie habitat, and staff served on the Catawba River Task Force Implementation Committee.

Least Tern management activities included posting ground-nesting colonies in an attempt to minimize human disturbance. In addition, we were involved in consultations to modify 3 rooftops to provide shade structures and perimeter barriers to minimize chick mortality.



Mission Statement

The South Carolina Department of Natural Resources is the advocate for and steward of the state's natural resources. The Department of Natural Resources develops and implements policies and programs for the conservation, management, utilization and protection of the state's natural resources based upon scientifically sound resource assessment and monitoring, applied research, technology transfer, comprehensive planning, public education, technical assistance and constituent involvement. The Department of Natural Resources is pro-active in protecting the state's natural resources for use and enjoyment by future generations of South Carolinians.

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